Making Everything Easier!™

Australian & New Zealand Edition

Sustainable Gardening

FOR DUMMIES®

Learn to:

- Design a sustainable garden at home
- Keep plants healthy without using chemicals
- Maintain a flourishing garden in drought-affected areas
- Restore biodiversity and embrace healthy gardening practices

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Sustainable garden consultant and teacher

Sustainable Gardening For Dummies®

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Sustainable Gardening For Dummies

by Donna Ellis

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About the Author

Donna Ellis lives and breathes anything horticultural! Her passion is obvious as she willingly shares her knowledge and experience with whoever will listen — and this group grows larger as more people have the opportunity to hear her words of wisdom. She challenges, provokes and empowers her listeners to make changes in their gardening practices so those changes will eventually become the ordinary, everyday procedures everyone employs. The stories she inevitably tells make people connect to the subject, whether it is about botanical gardens or backyard vegetable patches. You name it, she has a story about it, and these stories keep her audiences enthralled to the very end. Ask any of her students, community members or colleagues and they'll vouch for this.

Donna's work experiences at the start of her horticulture career, when chemicals and disregard for the natural environment prevailed, led her to believe there had to be more-sustainable alternatives. A firm believer in common sense and practical solutions to everyday garden problems, Donna has been a leading light of the sustainability movement since the early 1980s.

She is a horticulture teacher at South West Institute of TAFE in Warrnambool, Victoria, a sustainable garden consultant, a garden designer, a writer for newspapers and a speaker to community and professional groups. She works with Sustainable Gardening Australia, delivering seminars on sustainable management of parks and gardens in metropolitan Melbourne, and with Greening Australia, developing and delivering community workshops on backyard biodiversity throughout western Victoria. In addition to her usual teaching, Donna also develops and delivers sustainable horticulture training programs at TAFE to Special Developmental Schools, a labour of love.

She is a member of a number of organisations and networks, including Sustainable Gardening Australia, the Australian Garden History Society and the Friends of Warrnambool Botanic Gardens. She is a past president of the Friends of Hamilton Botanic Gardens and was a founding committee member of Encouraging Women in Horticulture Australia.

Donna owns and has owned a large variety of pets — goats, chooks, pigs, a horse and many dogs, including a Saint Bernard called Bernadette!

She lives with her partner by the sea. Since her recent research trip to

New Zealand, she is now planning a Kiwi-inspired garden for their new property. She kayaks, rides a bike, and grows her own vegetables and herbs, sustainably of course! She is also a great cook, using produce from her garden. Donna is a woman to be reckoned with, and now you can share in this huge part of her life — sustainable gardening.

Dedication

Thanks Jude, you said I could do this . . . as always, you were right.

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Writing a book like this is definitely not a solo exercise. There is way too much information and expertise here for me to have in my head. This book could not have been written without those curious and committed professionals who research, promote and publish the principles and practices of sustainability — those who go about the business of promoting sustainable gardening through their research, publications and workshops. Thanks to them, I have been able to carry out the necessary research for this book.

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Introduction

Welcome to *Sustainable Gardening For Dummies*. Gardening sustainably helps to reduce pressure on the planet's precious non-renewable resources and helps you get back to basics and in touch with the Earth and its cycles and seasons.

Things seem to be moving so fast, with change happening at an alarming rate. Putting your head in the sand and saying everything's too hard and there's nothing you can really do to make a difference can be all too easy. But you're not the sort who waits for others to lead the way and take responsibility; you get out there and have a go.

Whether you're new to gardening or an old hand, I'm happy that I'm able to share the journey to sustainable gardening with you.

About This Book

This book provides you with hints and tips about all sorts of areas of your garden. I cover quite a lot of ground, so you can use it as a reference when you need it. I include some useful web addresses where you can get more information about some of the topics, so you can apply what you learn to your specific location.

Sustainable Gardening For Dummies is about how you can take the lead and empower yourself, your neighbours, your community and, most importantly, your family to make a difference in all backyards.

How to Use This Book

Sustainable Gardening For Dummies is divided into self-contained chapters, so you don't need to read the book from front to back to get the information you need, although you can do that if you want. If you're new to sustainable gardening, you might want to start at Part I and work your way through the book.

Otherwise, you can just go to the part or chapter that has the information you need. Treat it as a handy reference book and refer to

the parts you need when you need them.

At the back of the book I include a handy glossary of terms. I also give you a list of weeds for each state or region — plants that have escaped from their normal habitats and threaten to swamp native plants, as well as put agriculture at risk — so you can identify them, deal with them and avoid them.

Foolish Assumptions

All writers have to pick and choose the information they present to the reader based on some simple assumptions about who they think will be reading. Here are some of my assumptions about who you are:

- You have an interest in living and gardening in a greener, more Earth-friendly way. You probably have an interest in gardening sustainably.
- You want to make a difference to the planet.
- If you have kids, you probably want to get some good information so that you can help them to understand the importance of sustainable gardening and treading lightly on our Earth.

Conventions Used in This Book

I want to help you get the information you need as fast as possible. To assist you, I use several conventions:

- `Monofont` is used to signal a web address.
- When this book was printed, some web addresses may have needed to break across two lines of text. If that happened, rest assured that no extra characters (such as hyphens or spaces) are used to indicate the break. So, when using one of these web addresses, just type in exactly what you see in this book, pretending that the line break doesn't exist.
- *Italics* signal that a word is an important term.
- **Bold** words make the key terms and phrases in bulleted and numbered lists jump out and grab your attention.

Sidebars, text separated from the rest of the type in grey boxes, are interesting but slightly tangential to the subject at hand. Sidebars are generally fun and optional reading. You won't miss anything critical if you skip the sidebars. If you choose to read the sidebars, though, I think you'll be glad you did.

How This Book Is Organised

Sustainable Gardening for Dummies is divided into six parts, each part focusing on a different aspect of gardening sustainably.

Part I: Understanding the Basics of Sustainable Gardening

This part explains what sustainable gardening is and why you should practise it at your place. Find out why you should make a difference in your backyard. This part introduces you to the importance of soil — what it is, what makes a healthy productive soil, why you need to understand it and how you can nurture it. It also introduces you to that precious resource, water. Find out how you can sustainably use the water you have.

Part II: Designing a Sustainable Garden

The chapters in this part help you to understand the basics of designing your sustainable garden. Get to know and understand the space you have to work with, as well as what you want your garden to become. This part covers the principles of sustainable garden design, garden styles and choosing the right plants for your place. It also gets you thinking about how sustainable the landscaping materials you use really are.

Part III: Developing Healthy Habits in Your Yard

If you've ever wandered out into your garden only to be confronted by a sick plant and wondered what to do next, this part is for you. I show you the importance of biodiversity, the difference between good and bad bugs, and how to keep your garden healthy without resorting to chemicals. If compost is your thing, this is where you find useful hints and tips on making your own. Here you also get to know what mulch is best for your sustainable garden and why you should use it. But that's not all — I finish this part with a chapter on the often-neglected but important player in your sustainable garden, the humble yet vitally important worm.

Part IV: Growing Plants Sustainably

Part IV gets down to what gardens are all about, the plants. I give you some pointers on how to choose the right plants for your place and the difference between water-wise and climate-friendly plants. If growing food is your thing, I include a chapter here exploring the how, what and why of food gardens. This part also guides you through sustainable lawns, successful container gardening and some other great ideas for gardeners with limited space.

Part V: Other Schools of Thought

Many different philosophies are practised by sustainable gardeners; the chapters in this part guide you through three of those different approaches, with tips on where to find out more about these great ideas.

Part VI: The Part of Tens

It is a long tradition of *For Dummies* books to include a compendium of short chapters listing useful facts and simple tips. My chapters list some ways gardening sustainably rewards you, some weeds to look out for and some simple ways to keep your garden healthy and looking good.

Icons Used in This Book

Throughout this book you can find useful icons so you can note specific types of information. Here's what each icon means:

Wherever you see this icon, you find helpful strategies for implementing sustainable gardening practices.

This icon flags concepts and facts that I want to ensure you remember as you build your sustainable garden.

When I give this icon I'm serious. Some stuff can threaten your garden's health, not to mention yours.

Here I flag useful websites for you to find further information.

Potentially interesting but non-essential stuff that you can skip over if you want.

Here I give you inside stories about real people and their experiences — often more like a good bit of gossip over the back fence!

Where to Go From Here

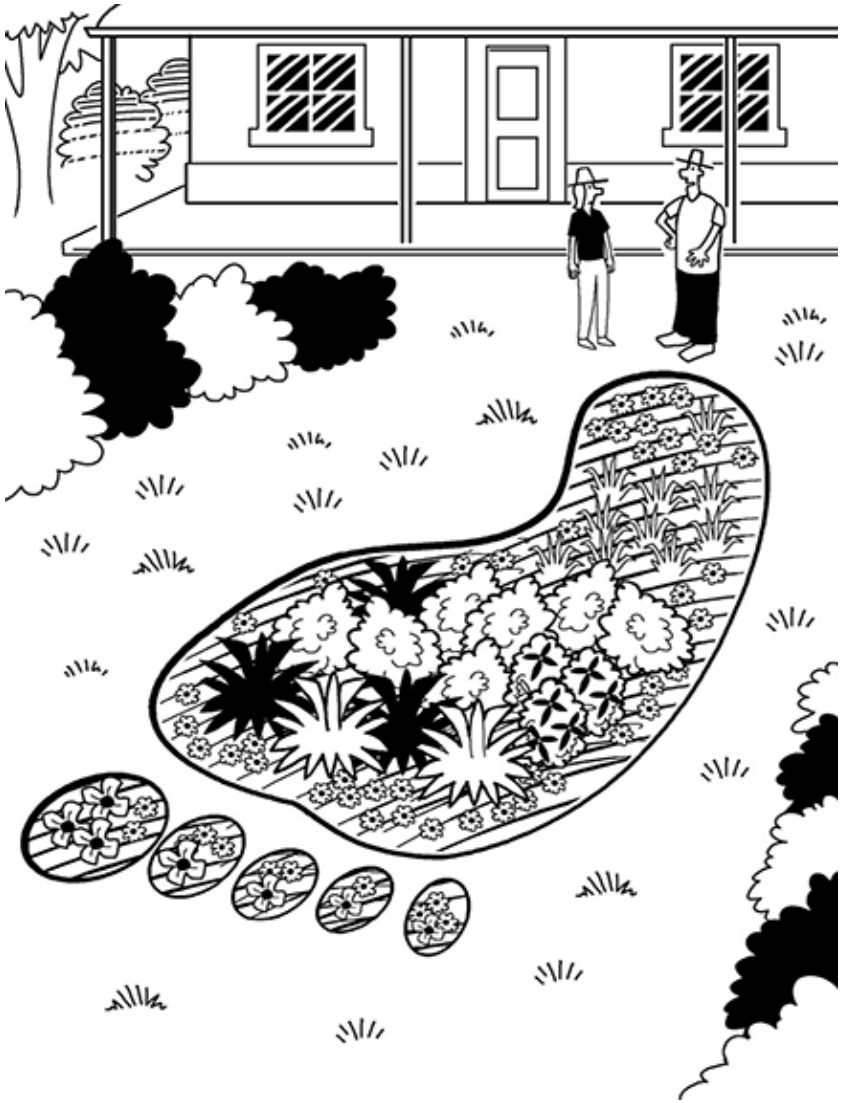
You can use the information I give you in *Sustainable Gardening For Dummies* in a number of ways. You may want to read every chapter at your leisure and have a good think about everything before planning your new garden or changing the way you do things in your existing garden. Or you may prefer to use it as a reference book to guide you in particular practices, trying out new techniques as you read the chapters that interest you most.

Whichever way you choose to use this book, at some point it's time to get your hands dirty. Please take this opportunity to make a difference in your own backyard that could just make a difference to the whole planet.

Part I

Understanding the Basics of Sustainable Gardening

Glenn Lumsden



‘This garden was designed to remind me of the size of my carbon footprint.’

In this part . . .

Sustainable gardening is about more than plants. It’s about your soil,

your water and how everything you do in your garden can have either a positive or negative impact on the planet.

In this part of the book, I first look at some of the main principles of sustainable gardening, and how sustainable gardening practices seek to respond to today's challenges, including climate change, regardless of its cause.

I then delve into the foundation of your garden — the soil — and show you how to assess and solve common soil problems. I also explore the vexed issue of water, its quality and how to use it effectively, as well as systems for recycling and harvesting this special resource.

This part starts you on your journey to embrace sustainable gardening.

Chapter 1

Introducing Sustainable Gardening

In This Chapter

- Making a difference
- Starting with good design
- Watching your water use
- Developing healthy habitats
- Growing your food
- Getting to know other philosophies
- Checking out the changing climate

I read an article recently that said, 'Sustainability is the new black'. It seems everywhere you turn these days the word 'sustainable' appears. Is it a bandwagon that has become trendy to jump on? Does sustainability really matter? Sometimes it seems that all is doom and gloom, and you're constantly bombarded with mixed messages about this or that sustainable method or product. Everything gets very confusing. You want to do the right thing but, amid all the seemingly conflicting advice, knowing what the right thing might be is hard.

Basically, though, *sustainability* is about living in a way that helps the planet rather than harms it. On a broad level, if the population consumes more of a particular resource than exists or can be replenished, that resource will run out — that level of consumption isn't sustainable. On a personal level, you can choose to live more sustainably in all aspects of your life, to do your bit for the planet (Michael Grosvenor's *Sustainable Living For Dummies* has a wealth of information about choosing a sustainable lifestyle). One very satisfying place to start is in your garden.

Gardening sustainably isn't as tricky as it may first seem. It's really

about getting back to basics and reigniting your connection with the Earth. Sustainable gardening is about building a solid healthy base for your garden that is self-sustaining, that doesn't need chemicals or artificial fertilisers, and that is kind to the planet.

If you're new at this gardening caper, this book sets you on the path to gardening sustainably. If you're an experienced gardener, it gives you valuable hints and tips to ensure your practices are sustainable. In this chapter, I touch on some of the basic principles of sustainable gardening.

Sustainable gardening is about understanding your environment and gardening in a way that has minimal impact on the planet. It's about being aware of how all the elements of your garden interact and what environmental impact they may have — your plants and soils, your water usage, your garden design and maintenance — so that they all contribute to creating a beautiful, liveable and functional sustainable garden. By gardening sustainably you can make a difference to not only your life, but the lives of your kids and the life of the planet.

Making a Difference with Your Little Backyard

'I only have a tiny backyard. Surely I can't make a difference.' If I had a dollar for every time I've heard that one! Of course you can make a difference. Gardening sustainably on any level contributes to the health of not only your yard, your area and your country, but also your planet. Whether your garden is a pot of herbs growing on your kitchen window ledge or a vast acreage, you can make a difference.

In a small yard, courtyard or even on your balcony, your plants still need water, fertiliser and the right soil. You still use materials, such as pots and outdoor furniture, and you still need to look after plants infected by pests or disease, or prevent infestations happening. To make a difference, think about how you garden and make sure the method and materials you use have the lowest carbon footprint possible. Reduce, reuse, recycle.

By gardening sustainably and planting as many different species of plants as you can realistically accommodate, you do your bit to store carbon. If you can, plant long-lived trees and shrubs with woody stems. It's the wood that stores the carbon long term. Building up your soil and composting your waste is also a great way of storing

carbon. You can even buy a composter, known as a bokashi bucket, that sits on your kitchen bench and is suitable for even a small garden (see Chapter 9).

So yes, you can make a difference in your little, or big, backyard.

From the Ground Up: Starting with Good Design

If you're building or renovating your house, you always start with a design. The same goes for your sustainable garden. Without a focus, you could end up making all sorts of mistakes. To design your sustainable garden you need to get a good understanding of all the elements that combine to create the environment you're gardening. A garden doesn't exist in isolation from its environment; it's part of a larger ecosystem. Chapters 4, 5 and 6 help you plan your garden using principles of sustainability.

By understanding how to plan your sustainable garden correctly, you ensure that it's not only a great place to be in, but it can also help to make your home more sustainable. The careful placement of trees and shrubs can cool your home in the hot weather and protect it from the cold, wind and rain. The result? Reducing your reliance on artificial heating and cooling, less greenhouse emissions and lower bills!

Using Water Wisely

In some regions, water is a major issue — you either have too much at certain times of the year or you've forgotten what rain on the roof sounds like, it's been so long since the last good downpour. You can't have a garden without water, even *xerophytes*, plants such as cacti, need water from time to time. Think about plants in the desert; they survive on minimal water, but they still have to have some.

Australia is the driest continent after Antarctica, and it's about time everyone understood that. For years and years in both Australia and

New Zealand, the traditional European models of gardening have been followed. Gardening in unsustainable ways, using water just because it's there, just isn't sustainable — in some cases it won't be there anymore. Some plants, both native and exotic, are incredibly resilient and can be 'trained' to be water-wise by infrequently giving them a good deep drink. At the other end of the spectrum, past practices have killed some gardens with kindness, making them dependent on artificial watering regimes by watering often and lightly.

As water supplies in some areas are dwindling, gardeners need to adapt and find better, more efficient ways of gardening. Recycling and harvesting precious water helps preserve those water supplies and their quality. Understanding your water supply, how much you have, where it comes from and its quality sets you well on your way to understanding how to conserve precious water so that future sustainable gardeners can use it. Chapter 3 gives you loads of information about water quality, recycling and harvesting.

Creating Healthy Habitats

Healthy gardens rely on a number of factors to stay that way, and you can do a lot for them through sustainable gardening practices, from the number and type of species you plant to the compost and mulch you use (see Chapter 9 for more on compost and mulch).

The decline in native habitat and resulting loss of biodiversity is becoming more alarming every year. Sustainable gardening goes a long way to helping to maintain precious *biodiversity*, the variety of species in a particular environment (see Chapter 7). You can create a haven in your garden for native insects, birds and other useful critters that all play an important role in the ecosystem.

Understanding what your plants need and what they should look like helps you to diagnose any problems they might have. A clever sustainable gardener can even manage to pre-empt and avoid some of the nastier plant problems by maintaining a healthy, well-balanced garden. In Chapter 8, I let you in on some maintenance secrets, including one of the keys to a healthy sustainable garden — knowing the difference between good bugs and bad bugs, and knowing how to avoid using chemical solutions to problems.

One of the healthiest ways to maintain your garden is by making and using your own compost (see Chapter 9). Compost not only helps to add nutrients and structure to your soil, it encourages the good soil

flora and fauna, and helps to store carbon. Add to this some great mulch and you're well on your way.

Food, Glorious Food

Being able to venture out in the garden and decide on the dinner menu by what's growing there is an amazingly satisfying feeling. No matter how big or small your sustainable garden, growing at least some of your own food makes good sense. Not only do you eat fresh, chemical-free and organic produce, you do your bit to reduce food miles and the resulting carbon footprint. Growing your own food in your sustainable garden helps you get back in touch with the cycles of the Earth and eating seasonally. Chapter 12 gives you some great tips on growing vegies, herbs, fruit and nuts.

No matter how much space you have, you can grow some of your weekly food. Even if it's just a small pot in the kitchen or a jar for sprouts, you get great pleasure from eating something you've grown yourself, and you save money!

Exploring Other Philosophies

Gardening, like many things, has a number of different schools of thought and philosophies. I encourage you to explore all the ideas out there and find the one that's right and attainable for you. You can even use bits and pieces of ideas and methods to suit your place.

In this book, I give you a rundown of three of the main philosophies — organic gardening, permaculture and the biodynamic movement (see Chapters 15, 16 and 17). By no means are they the only ones out there. Do some research of your own and find the right one for your place and your lifestyle. Some may seem almost like a way of life or, as I've heard them described 'almost a religion'. Hey, if it's good for the planet and doesn't harm anything on it, including the people, it's fine with me.

Climate: Times Are A-Changing

Talk of climate change or global warming seems to be everywhere you turn these days, from climate change believers to climate change sceptics and those who are somewhere in between. Governments the world over are talking and sometimes arguing about emissions trading schemes, whose carbon footprint is biggest, who should do something first and how it will affect the economy if anything is actually done.

I'm just a gardener, not a climate scientist, but even I can see that things are a bit different. Whether people are to blame or it's some sort of cyclical phenomenon, I'm really not qualified to say. If you want the facts, seek the advice of a climatologist. These people specialise in the field, so they probably know what they're talking about. After all, if you had a sore leg and needed surgery, would you consult the person who services your car?

Whether you like it or not or believe it or not, the climate is changing and it will impact on everyone. Rain may be a bit more or less frequent than before, the ski fields in some areas may have a bit less snow, and flowers may appear much earlier or later than you expect. Watch the news and you see all sorts of extreme weather events, from raging bushfires to typhoons and disastrous floods, resulting in mass destruction and tragic loss of precious lives.

The effects of climate change are being felt throughout the world, with shrinking glaciers, melting of the permafrost and lengthening of growing seasons, according to a United Nations report on climate change. The melting of the great glaciers in the Northern Hemisphere are potentially putting millions of lives at risk, through flooding, decline in water availability and quality, and subsequent inability to produce food crops.

In Australia and New Zealand, the likely impacts of climate change could include:

- Higher temperatures
- Rising sea levels, not good for those on the coast or living on an island
- A change in traditional rainfall patterns (in New Zealand higher rainfall is expected in the west and lower rainfall in the east)
- More frequent extreme weather events such as drought, floods and

fire

No, not the wine!

Talk in France is that climate change or global warming will destroy the centuries-old wine regions. Climate change is already being blamed for destruction and damage of some of France's best and oldest vineyards. The warmer temperatures and changing weather patterns have seen vineyards battered by hailstorms, hit by heatwaves and infected with plant diseases not seen in those areas before. Not only that, as the temperature increases, it is thought the complexity of the wines may decline. The fear among some of the finest winemakers and chefs in France is such that they have sent a letter to the French president asking that something be done on both the local and global stage to reduce greenhouse gas emissions.

The changing climate may leave your garden vulnerable to invasion by weeds, both exotic and native, new pests and new diseases, and some areas may experience a dramatic decrease in the availability of water.

Regardless of the 'official' cause of climate change, the cost of doing nothing is too high. The effects of our warming planet are already apparent. Some change is already inevitable, but, by making significant change now at both a local and global level, some of the catastrophic effects may be avoided.

You can check out what's going on in your country by going to the websites for Climate Change New Zealand (www.climatechange.govt.nz) or the Australian Department of Climate Change (www.climatechange.gov.au). Or subscribe to the United Nations Framework Convention on Climate Change newsletter at http://unfccc.int to find out about the latest efforts on a global scale.

A recipe for disaster

In February 2009, Victoria experienced what's called an 'extreme weather event'. A slow-moving high-pressure system combining with a monsoonal trough directed hot air over the south-east of Australia. This, along with strong northerly winds gusting, at some points, at over 100 kilometres per hour and low humidity,

brought some of the hottest temperatures on record, with the highest temperature ever officially recorded in Victoria of 48.8 degrees Celsius at Hopetoun in the north-west of the state. Add to this over ten years of drought. All of these factors combined to cause the most lethal bushfires in Australia's history. The Black Saturday bushfires killed 173 people. Countless homes and businesses were destroyed, along with vast tracts of native bush and some beautiful gardens.

Chapter 2

Soils Ain't Soils

In This Chapter

- Getting to know your soil
- Finding friends in your soil
- Making indifferent soil better

If you're building your dream home, you start with good solid foundations, right? You engage a builder and maybe an architect, and together they create your home. The architect comes up with a plan for a house that suits not only your requirements, but (ideally) the site where it's to be built. The builder then comes along and builds your house. But where does the builder start? Not with the roof or the walls! But with a good solid foundation on which to commence the structure. Gardens are no different.

The key to gardening sustainably is understanding that soil is the foundation of a healthy sustainable garden. So a good garden starts with good healthy soil. You walk on soil, dig in it, play on it, sit on it and generally take it for granted. By getting to know the world beneath your feet, you learn to respect your soil, and in time will also love and revere it for the joy and rewards it brings to your life.

In this chapter, I show you how to identify the type of soil you have and introduce you to some basic chemistry to help you really get to know it. I also introduce you to the plants and animals that lurk under your feet — amazing creatures working tirelessly to provide you with rich and fertile soil, which is the basic building block to get you started in the world of sustainable gardening.

Finally, I show you some simple steps to create healthy, sweet-smelling, well-draining soil that's full of life.

Checking Out Soil

We walk around on it, look at it, wash it off our bodies every day — mostly without even noticing — but what is it? Aren't dirt and soil the same thing? Not at all! Dirt is something you sweep off the back verandah; soil is a vibrant, living, irreplaceable part of our planet, to be conserved and nurtured.

While soil and dirt are completely different things, growing media are different again. I use the word 'soil' to mean something naturally occurring, whereas the term *growing media* covers everything else that plants can grow in. A common example of growing media is the potting mix you buy in a bag at the garden centre. This has been manufactured to certain requirements in order to grow certain types of plants in pots. You can get specific mixes for things like orchids, natives and other special plants.

In a nutshell, soil comes from rocks. The type of soil in your area depends on the types of rocks originally there. These rocks have been ground down over millennia by erosion to form your soil. That's not all that makes it, however. Soil is generally made up of a mix of five things:

- Mineral particles (the rocks)
- Organic matter, also known as humus (the remains of living things)
- Water
- Air
- Living things

Proportions of these things vary depending on what has happened to the soil over the years, including the level of rainfall, drainage and cultivation.

The trick is to get all of the above five elements in the right proportions for what you want to grow at your place. It's not rocket science, it's soil science.

Many urban gardens are not built on natural soil at all. Particularly if you have a new home, you may find the natural soil was cleared to make way for your house and sold to some bloke down the road. So what you actually have is the subsoil with a bit of commercially produced 'garden soil' plonked on top. In some

circumstances, this can cause all sorts of headaches for gardeners. I've seen many instances where gardeners have tried to establish a garden full of plants native to their area, only to discover that the soil they were planting in wasn't the original soil at all, and all the plants died.

Geology 101

Remember those science classes in school where an earnest teacher tried eagerly to introduce you to the delights of the geological time scale and the main types of rock, while you stared at the back of the head of the school prefect you fancied but were too afraid to speak to? Well, you didn't really need to pay attention after all — here's all the geology you need to know to garden sustainably.

Rocks are formed by the Earth's heat and pressure. The level of both determines what kind of rock is formed. Three types of rock occur:

Igneous: A type that comes from lava deep in the Earth

Sedimentary: A type formed from the weathering of other rocks

Metamorphic: Rocks that have been changed by heat or pressure

The cooling, heating or slow weathering of the rocks over a very long time creates soil particles. Add decomposing plant and animal material, and soil is created. The type of soil you end up with depends on the time it has taken to break down, your climate, the vegetation and the *topography* — the slope of the land and position on the landscape. The key is understanding what you have and how you can make it work for you.

Basic soil chemistry

Soil is essentially a mix of organic and mineral bits. This is what soil does for your plants:

- It holds them up.
- It stores food for them.
- It holds oxygen.

How soil does this depends on a whole lot of stuff. Soil chemistry is a pretty complex and tricky subject. However, what you need to know as a sustainable gardener is really rather simple. You want to know how to grow a healthy, well-formed, colourful and maybe even delicious garden. To do this, you need to know some very basic chemistry and the most important part of this is pH.

Pondering soil pH

People who talk about plants love to talk about pH. Sometimes it seems like a secret society speaking in code. 'My azaleas are a bit crook; I reckon the pH is a bit too high and out of whack.' What on Earth are they talking about? Cracking the code is not so hard at all, however. Put simply, *pH* is a measure of acidity and alkalinity. It's measured on a scale of 0 to 14, as shown in Figure 2-1. A soil with a pH of less than 7 is considered acidic, in increasing degree to 0, pH7 is said to be neutral, and above 7, increasingly to pH14, is called alkaline. You can also think of it as sweet and sour. In fact, soil that is very acidic sometimes smells quite sour, a bit like vinegar.

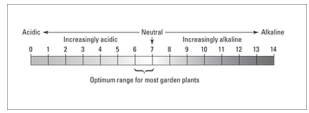
You may be wondering what all this has to do with real gardening. It has lots. The pH of your soil controls how much food your plants can get from it. If your soil's pH is either very low or very high, your plants can be seriously damaged and even die. As a general rule, the majority of plants like a pH somewhere in the middle, pH6 to pH7. Even if it's just slightly out of whack, it can cause toxicity, kill soil microorganisms, reduce the soil nutrients and make your plants sick and hungry. Some plants, such as azaleas, camellias and rhododendron, actually love acid-type soils, whereas drooping she-oaks, silver banksias and manukas like alkaline soils.

You don't need a science lab to work out the pH level of your soil. User-friendly test kits are available at garden centres and hardware stores. With one type of test kit, you mix a small soil sample with some chemicals supplied, and then compare it to a colour chart. The colour chart is actually a pH scale in more of a picture form. Another type is a meter you insert into wet soil. Whichever you use, read the instructions and make sure you collect samples from several spots in the garden.

In fact, pH is a measure of the number of hydrogen (H+) ions and hydroxide (OH-) ions in the soil. By the way, ions are atoms with either missing electrons or extra electrons — but that's way too much chemistry. If the soil has lots of hydrogen ions, the pH is low; if it has more hydroxide ions, the pH is high. The level depends on the makeup of the soil.

Changing pH can be fraught with uncertainty. If in doubt, stick with the soil you have and choose plants to match. To find out which plants like which soil pH, just ask at your local nursery or garden centre. However, if you just can't help yourself and want to alter the pH, check the information in the rest of this section.

Figure 2-1: A reading on a pH scale indicates the level of acidity or alkalinity of your soil.


Acidic
Neutral
Alkaline
Increasingly acidic
Increasingly alkaline
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
Optimum range for most garden plants

Raising pH

By far the best thing to add to any soil is organic matter. Well-rotted chook manure is a great choice because of its naturally high lime content; it not only raises the pH slowly, but it also helps add other goodies your plants and soil love. Add about a 5-litre bucketful per square metre, dig it in and then water well. Concentrated forms, such as Dynamic Lifter, won't do the job; they add nutrients but don't change the pH level.

If you prefer not to use chook manure, you should be able to buy limestone or *dolomite*, a limestone-based product, from your garden centre or hardware store. How much to use depends on your soil type and how far you want to raise your pH. For example, to raise the pH in clay soil from 5.5 to 6.5, you need to add about 900 grams

per square metre.

Don't use builders' lime or Limil — not only are these more expensive, they're more concentrated, so you can easily use too much and send your pH level skyrocketing. Beware that adding lime can also have a nasty effect on the microorganisms essential for healthy soil.

Lowering pH

If lowering the pH to get a more acid soil is your aim, you can add sulfur or iron sulfate. You can buy these products at your nursery or hardware store. Follow the directions on the packet, sprinkle it over your soil, dig it in and water well.

Loving what you've got

Your best bet is to learn to love the soil you have and simply add lots of organic matter and manures. This helps to increase the soil's water-holding capacity, makes great conditions for the beneficial soil critters and makes a great sustainable base on which to build your garden.

Improving soil doesn't necessarily mean changing it completely. When growing natives, it doesn't really matter if you have acid or alkaline soil; just choose plants that suit your garden and you'll be right. If in doubt as to which plants to grow, check out the neighbourhood to see what's flourishing in other gardens, ask at your local nursery or garden centre or, better still, join your local garden club. Not only do you get to know other garden lovers, but you also get the benefit of great local knowledge. If you have acid soil and want to grow an alkaline-loving species, grow it in a pot where creating the right conditions is easier. (For more on container gardening, see Chapter 14.)

Getting to know plant nutrients

No doubt you know the saying, 'You are what you eat' — if you don't look after yourself and eat the right food, you get run down, stressed,

feel sick and don't perform at your best. The same goes for your plants. They might look happy and healthy for a while, but they're just using up all the nutrients they have stored in their system. Eventually, they run out of supplies and look more and more stressed and off-colour. They may even be the target of some nasty pests and diseases, which take advantage of their weakened state until eventually the plants are so sick they stop flowering, their leaves discolour or drop off and eventually they can die. Unlike people, plants can't go to the cupboard or fridge for a snack; you need to provide it for them. They get their food from the air and whatever it is they're growing in. So it's up to you to make sure all of the goodies they need are within easy reach. For your plants to be happy and healthy, their nutrient requirements need to be met.

A sustainable garden is a healthy garden, and healthy gardens start with healthy soil. Healthy soil has the right balance of nutrients your plants need to thrive, which saves you time and money. To get the right balance of nutrients, you need to know a bit about what they are, what they do, how they get there — and, most importantly, how to keep them there for long enough to do some good.

Plants need a whole bunch of nutrients to grow big and strong — 16 in all — and some are more important than others. The important ones are nitrogen, phosphorus and potassium, which take care of leaves, fruit and flowers, and overall vigour. You've probably seen 'NPK' on the label of a packet of fertiliser. The label might say something like NPK 16:4.4:10. Don't panic. All you need to know is that N stands for nitrogen, P is phosphorus and K is potassium. (The Latin word for potassium is Kalium, hence the chemical symbol of K!) The numbers after the letters indicate the percentage of each particular element in the fertiliser. So here you'd have 16 per cent nitrogen, 4.4 per cent phosphorus and 10 per cent potassium. Well that's 30.4 per cent. What on Earth is the other stuff in the bag? Well, it's made up of various other macro- and micro-nutrients in varying amounts.

All fertilisers are specially designed for a particular use. You can learn more about fertilisers in the section 'Feeding and conditioning' later in this chapter.

Plants need a good balance of nutrients — too much of one nutrient can stop your plants getting some of the others they need or simply

give them too much of one type, and this can cause all kinds of headaches.

Beware of new housing subdivisions. Some have been built on land that once was used for agriculture and may have a history of high fertiliser use, particularly phosphorus, which some Australian plants hate. So whatever side of the Tasman you're on, the general rule when growing Aussie natives is to avoid any fertiliser with high phosphorus levels. This doesn't apply to Kiwi natives however.

Where plant nutrients come from

It all comes down to chemistry. Plant roots growing in soil are covered by a very thin film of water, which is called *dilute soil solution*. As the plant breathes out through the root cells, it makes carbon dioxide (CO^2). CO^2 combines with water (H^2O), releasing hydrogen ($H+$) ions, bicarbonate (HCO_3) ions and carbonate (CO^{32}) ions. The formula looks like this:

$H^2O + CO^2$

H^2CO^3

$H+ + HCO^{3-}$

$2H+ + CO^{32}$

The ions move from the root cells to the surrounding water in the soil. When this happens, the H+ ions may exchange with positively charged ions associated with negatively charged surfaces of soil solutions. This is called the *cation exchange capacity (CEC)* of the soil. CEC is important as it is used in soil science as a measure of fertility, nutrient retention and the ability of a soil to filter pollutants. The better the CEC, the more plants are able to absorb the amount of nutrients they need.

Good soil can act as a filter to stop the contamination of precious groundwater. All this chemistry is really useful in understanding how soils work and how you can best use your soil and water sustainably.

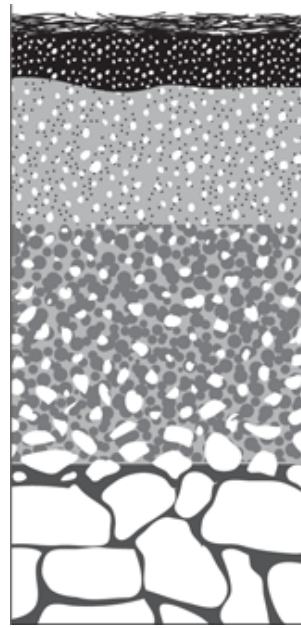
Soil testing

Have you ever noticed when digging in the soil that some soil is much easier to dig than others? You may be digging your garden and find that on one side of it you can dig a hole as deep as you are high but on the other you can hardly get a spade in.

If you're really lucky, your garden might have a generous amount of silt or loam. *Silt* is very fine sand or earthy matter that has at some point been moved by running water and deposited as sediment. Remember back at school when you learned about the rich, fertile River Nile? The rich, fertile bit was the silt. As for *loam,* it's an ideal combination of a relatively equal mix of sand and silt, and a *smaller* proportion of clay.

You can find out the depth, structure and texture of the soil in your garden. Go outside and dig as deep as you can go until you notice a change in the colour of the soil in the hole. The soil in the first colour band is your topsoil, the next one is your subsoil. These different bands comprise the *soil profile*; an example is shown in Figure 2-2. Below the subsoil you might reach parent material, which is what the soil is actually formed from. It could be organic matter, deposits from an old volcano or stuff left behind when wind, water or maybe even glaciers have moved across the landscape. Depending on where you live, there might be none of that, the parent material might simply be the bedrock, the original rock that the soil above was created from.

Figure 2-2: A typical soil profile. Yours may look slightly different but you get the idea.



Be aware that if your block has been cleared prior to building your home, you may not have any topsoil at all. Common practice in some housing developments is to clear the site before building, which involves scraping the site to make it level. This scrapes the top layer of the soil away, and that would be fine if it was left on site to put back after your house is built but, unfortunately, all too often the topsoil is removed completely from the site, never to return. What you're left with is subsoil. As most of the goodies your plants need is in the top layer, the topsoil, you can have all sorts of problems building your sustainable garden. You'll have to add lots of organic matter and start rebuilding your soil.

Checking the colour

Take a sample of your topsoil — about a small ice-cream containerful will do. The first thing you notice about your soil is the colour, which says much about how many goodies are in your soil. The range of colours include:

- **Black soils:** Containing lots of organic matter, black soils drain slowly, generally hold water well and hang on to nutrients. This

makes them ideal for a sustainable garden, because they don't need lots of water or food and are full of life.

- **Red and brown soils:** These soils are medium to high in their content of organic matter and have good drainage.
- **Yellow soils:** You don't find as much organic matter in yellow soils and drainage can be poor.
- **Light grey soils:** Often called bleached or washed-out soils, light grey soils drain well but have little organic matter and tend to leach nutrients.
- **Grey or blue-grey soils:** Although these soils have terrible drainage and don't contain much organic matter, they do manage to hang on to nutrients.

As a general rule, the darker the soil, the better it is for general garden plants. However, the type of soil you have depends on where you live.

Native plants have adapted brilliantly to their native soils, so consider these plants when planning your sustainable garden. You can find out about plant selection in Chapters 5 and 11.

Assessing the texture

Now you've worked out the colour of your soil, what about its texture? Does it have big clumps that hold together? Or is it crumbly like fresh breadcrumbs? Or perhaps it runs through your fingers like sand through an hourglass. When you know the texture of your soil, you know how much work you have to put into it. The following steps tell you how to examine the texture. Time to get your hands dirty.

1. **Take enough soil to fit in the palm of your hand; chuck out any big bits.**
2. **Wet the soil a bit at a time, and then knead it.**

   Don't put so much water on it that it sticks to your fingers.
3. **Have a look; can you see sand or can you feel sand?**

   If it's sandy, you can see, feel or even hear it. It makes a kind of 'squeaky' sound.
4. **Now try to make a ball.**

If you have lots of clay, you can make a firm ball that feels a bit like plasticine. If there's lots of silt, it will be silky and slippery.

5. Gently press the sample between your thumb and forefinger to make a ribbon.

The length of the ribbon helps you work out your soil type. The longer the ribbon, the more clay you have, and the harder it will be to dig.

Now use Table 2-1 to identify your soil type by its texture.

Table 2-1 Assessing Soil Type by Its Texture

Soil Type	Texture
Sand	Can't be moulded; single grains stick to your fingers
Loamy sand	Forms a fragile ball; short ribbon to 6 mm that breaks easily; stains your fingers
Clayey sand	Forms a fragile ball; sticky when wet, sand grains stick to fingers; stains your fingers; minimal ribbon 5–15 mm long
Sandy loam	Forms a ball that doesn't handle well; individual sand grains can be seen and felt; ribbon 15–25 mm long
Fine sandy loam	Forms a ball that doesn't handle well; can't see individual sand grains, but can feel and hear them; ribbon 15–25 mm long
Loam	Forms a spongy ball with no obvious sandiness or silkiness; if it has lots of organic matter, it might feel greasy; ribbon 25 mm long
Silty loam	Makes a ball but crumbles; smooth and silky feel; ribbon 25–40 mm long
Sandy clay loam	Forms a ball where you can feel sand grains; ribbon 25–40 mm long
Clay loam	Forms a spongy ball; a bit like plasticine, smooth to manipulate; ribbon 40–50 mm long
Sandy clay	Ball feels like plastic; you can see, hear or feel sand grains; ribbon 50–75 mm long
Silty clay	Smooth plastic ball; ribbon 50–75 mm long
Medium clay	Medium plastic ball, very like plasticine; can be moulded into rods without breaking; ribbon 75 mm or more long
Heavy clay	Heavy plastic ball like stiff plasticine; can be moulded into rods without breaking; ribbon at least 75 mm long

In any garden soil, the availability of nutrients to your plants depends on the pH level of your soil. To find out about pH and how to work out what your soil pH level is, refer to the earlier section 'Pondering soil pH'. The water-holding capacity and amount of air in your soil depends on the amount of organic matter, and the amount and size of the mineral particles. If in doubt, consult a professional. To find a soil professional in your area, check the Yellow Pages under a heading such as 'Soil Testing and Investigation', ask at your local garden centre or contact your regional office of the department of agriculture or equivalent state department.

Testing, testing, testing

Another fun test you can do with the kids is what the boffins call a *particle size analysis*. To you, me and the kids, it's a great way of actually seeing how much sand, silt and clay is in your soil. To make it more fun, get a few different samples of soil. To do this simple test:

1. Find three large screwtop jars — large Vegemite jars are perfect.

2. Into each jar, put three heaped tablespoons of your different soil samples.

3. Add about a quarter of a teaspoon of detergent to each jar, half fill it with water and put the lid on.

4. Give each jar a good shake.

Don't forget to put the lid on properly! If you don't, it makes a horrible mess, especially if you're doing it in the kitchen like I did!

5. Leave the jars to stand undisturbed for at least 24 hours.

When your jars have settled out, you will see that the heavier, bigger bits have sunk to the bottom. Finer bits will be on the next layer and so on. The big bits at the bottom will be sand, and the finest at the top will be clay. The percentage of these layers can be used to work out the composition of your soil. This is a great starting point when you're getting to know your soil.

So why is all this stuff so important? Working out the texture of your soil tells you the size of the particles in the soil and the proportions of them combined to make up the structure of the soil. Structure is important because it tells you how well the soil will hold water and if plants will grow in it. For example, if your tests show that the texture of your soil is heavy clay, then the structure of your soil will be dense and heavy. Your soil is likely to be waterlogged and not have much air in it, and the poor plant roots won't be able to move easily through it. You can find out how to improve your soil in the section 'Rehabilitating Your Garden Soil' later in this chapter.

Meeting the Critters That Lurk in the Soil

A whole world lies under your feet and you probably didn't know it was there. Healthy soil is teeming with all kinds of critters. If you ever get a chance to look at some of them under a microscope, you'll

understand where the inspiration for alien creatures in sci-fi movies comes from. The technical terms for these critters are microorganisms and macroorganisms — little critters and big critters. The little ones are things like fungi and bacteria, and the big ones are worms, termites and ants. You may be surprised to know that the big critters are far less common.

Estimates reveal that about 2,000 microorganisms per square metre occur in the top 15 centimetres of fertile soil, compared with only 400 worms. The size of the populations of these critters in your soil depends on a whole stack of things, such as:

- Amount of organic matter
- Temperature
- Amount of water
- Types of minerals
- Air content
- pH level
- Types and amount of nutrients

Plants don't grow on their own; they hang around with a whole gang of other organisms, most of which are good, although some can be toxic and can harm or even kill your plants.

Some of the little critters, in particular the microorganisms, are the guys that transform nutrients into something that plants and other little critters can use as food — so they are very important to the health of your plants. Most of these microorganisms are in the top 5 centimetres of your soil, because this is where the food is. (Think about them next time you dig or drive your car on the lawn. Ouch!)

The weight of microorganisms in the soil has been calculated as being 25 times the weight of all living animals and life forms living above the soil. That's a lot of critters! Less than 2 per cent of them have been identified.

The *soil food web* is a way of describing the relationship these guys have to each other, based on the type of tucker they prefer. The web starts with organic matter, which bacteria and fungi break down by eating; they in turn are gobbled up by nematodes, protozoa, worms and other critters; the nematodes and protozoa are eaten by mites; the mites are eaten by beetles and ants — and on it goes.

Even in the driest climates, millions of critters exist in just 1 square metre of soil. A study done in outback Western Australia found more than 800 million of the little fellas in a square metre of pasture.

With so many of these fabulous critters in your soil, adopting sustainable gardening practices helps them. The more you disturb your soil, the more you are disrupting the lives of these little friends. A good healthy soil has a good healthy balance of the good guys and makes the bad guys leave town.

Rehabilitating Your Garden Soil

The best garden soil is loam. Unfortunately, you might have soil that is closer to concrete or sand than nice fertile, *friable* (which means it's easily crumbled) loam. Poor soil can result from it having been overworked, having chemicals or too much or too little water poured on it, or maybe from urban development. You may even find that your soil has been trucked in from somewhere else and bears no resemblance to what was originally there. To have a healthy and sustainable garden you need to start with healthy sustainable soil. If your soil is old and tired and the nutrients have all leached out, your plants will suffer and probably starve. Just like your house is only as good as its foundations, your garden is only as good as your soil.

A healthy soil is a soil containing all the right stuff in all the right quantities. It has masses of good little critters, such as fungi, bacteria, protozoa and nematodes, and a healthy population of the big guys, such as worms, ants and termites. (I discuss these critters in the section 'Meeting the Critters That Lurk in the Soil' earlier in this chapter.) Healthy soil can hold water yet drain freely; it has a nice neutral pH so that your plants can get all the food they fancy.

Your garden grows happily and looks fabulous. If your garden doesn't quite fit this description, in this section I show you ways to make even the most desolate soil into a fabulous fertile home.

Solving common soil problems

To fix soil problems, you first need to know what you are dealing with. (Refer to the section 'Soil testing' earlier in this chapter.)

Your soil looks as if it belongs on the beach

So all you have is sand. You can water it endlessly, but nothing stays put. The best thing you can do is add masses of well-decomposed organic matter, basically *compost*, but technically its end product, *humus*, which is explained in detail in Chapter 9. The best thing about sandy soil is it's easy to dig, so adding all of that compost and digging it through isn't such hard work.

Spread your compost about 50 millimetres thick, and then dig it in to about half that depth. Now, spread a layer of *mulch* (any vegetation cover, such as bark or leaves) over the top and voilà! You have started your soil improvement program. (See Chapter 9 for the full lowdown on compost and mulch.) Make sure the compost you use is fairly fine — if it has big bits they won't stick to the sand particles and will just leach right out. What makes the bits stick together is a chemical reaction, but you can think of it as a bit of glue in there making the particles cling together. Keeping the compost in the soil helps build organic matter, which then makes a haven for microorganisms, worms and other friendly critters, and helps you on your way to creating a rich, fertile, sustainable soil. Depending on how sandy your soil is, you probably need to keep topping up the compost every year. You may not end up with perfect loamy soil, but you'll definitely be creating a better, more fertile environment for your plants.

Your soil has so much clay you could start a pottery

If your soil is clay, dig it when it has a bit of moisture in it, but not too much. (If it's too dry, you'll need a backhoe; too wet and you'll need a dredge!) Once you've dug it over, throw on some coarse compost to a depth of about 50 millimetres and maybe a bit of *gypsum* (a mineral soil conditioner — see the section 'Feeding and conditioning' later in this chapter) or a clay-breaker. Dig all of this in to about 25 millimetres and then of mulch over the lot. Adding compost to your clay soil helps to add rich organic matter to help turn your clay into a richer, more fertile sustainable soil that's less prone to becoming dry and cracked or sloppy and waterlogged. (See Chapter 9 for types of compost and mulch.)

Where I grew up, the soils are clay. If someone wanted to put in a new lawn, they would dig it over and then plant a crop of potatoes, which break up the soil. So for several months, you saw no lawn, just a slightly odd-looking field of potato plants. Not ideal for backyard cricket, but great for the seemingly endless supply of chips we ate. This crop not only fed the family and half the neighbourhood, it also served to break up the clay and aerate the soil, making it easy to dig. Once all the spuds were harvested, the result was a good friable soil ready for the sowing of grass seed. Old blokes in the neighbourhood swore by it as the best and easiest way to achieve a great lawn.

Your soil is wearing an oilskin coat

Forget drainage or waterlogging; some sandy soils just don't let water in at all. No matter how much it rains or how efficiently you irrigate, the water just beads and runs off. Water resistance is great if the water is falling on your new raincoat or your just-waxed car; not so great if it's happening with your soil.

A way to check water retention is to water the area well and then dig down a couple of centimetres. If the soil's as dry as a bone, you may have what's called water-repellent soil or, to use the technical term, *hydrophobic* soil. Yes — soils have phobias too! The soil can form a sort of crust and water just runs off the top. This problem can affect not only sandy soil, but also soils that have really high organic matter, and some potting mixes.

You may think that going off and buying a few bags of mulch and bunging that on will fix water-repelling soil, but sometimes that only makes it worse, or it may be what caused the problem in the first place. If the mulch you use has pretty big bits, these big uncomposted bits sit on your sandy soil. As the mulch breaks down, oily waxy stuff is exuded and coats the tiny soil particles. When this happens, no matter what you do, water can't get in and your soil stays dry.

When you compost and add mulch, bacteria and fungi help to break down the waxy stuff, and when you mix the delicious compost into your soil, it actually helps to form little cracks in the waxy surface to help water get through. Compost also causes the microorganism population to explode, helping to bind the mineral particles in your soil, improving the structure and helping it hold moisture.

Add compost to your soil, each autumn and spring, so the little critters have a regular food supply. (See Chapter 9 for more detail on compost and mulch.)

Another way to improve water retention is to add a *wetting agent*, which you can get from your garden centre or hardware store. Wetting agents work by making the water more effective or even wetter! They actually reduce the surface tension of the water, allowing it to wet the waxy surface of the soil particles so the water can then get into the soil. Wetting agents come in granular and liquid form. The advantage of the granules is that they leach out gradually whenever they get wet. The liquid form is easy to apply, but use caution, because it can damage the leaves of some plants if you accidentally splash them.

Some people recommend detergent as a wetting agent. However, commercial detergents can have high levels of salts, which can seriously damage your plants and interfere with the life cycles of some aquatic critters, not to mention your soil's structure, so I'd give them a miss. Commercial detergents are not for you in your sustainable garden.

Feeding and conditioning

No matter what style of garden you have or are creating, a good garden needs good fertile soil. You don't need to bung on tonnes of fertiliser to achieve this.

Good garden soil has roughly equal measures of clay and sand with lots of organic matter and humus. A little bit of the right kind of fertiliser can help you achieve a healthy, sustainable garden.

Typically, fertilisers provide your plants with the three major plant nutrients — nitrogen, phosphorus and potassium — with the other nutrients or trace elements in smaller amounts. I discuss these nutrients in the section 'Getting to know plant nutrients' earlier in this chapter.

By far the best all-purpose fertiliser for your sustainable garden is a mix of quality compost and animal manure. Better still if you make the compost yourself. However, that could be a bit tricky if you live in an apartment. If you do, you can buy some great ready-made preparations in small containers or spray bottles.

The two main categories of fertiliser are organic and inorganic. Put simply, *organic* is something that was once living; *inorganic* can't make the same claim. Nowadays, you may also hear the terms *natural* (organic) and *mineral* (inorganic). Just because some fertilisers are inorganic, doesn't mean they're not 'natural' and don't have a place in your sustainable garden.

Before adding any form of mineral fertiliser it's important that you test your soil to find out the pH and check that you're using the right type and amount of fertiliser to suit. (Refer to the section 'Pondering soil pH' earlier in this chapter.)

The difference between synthetic and natural fertilisers is that natural fertilisers are things that are naturally occurring and collected, such as manures, kelp and limestone. The nutrient content of these fertilisers can be variable, particularly if you've collected them yourself. Synthetic fertilisers are artificial fertilisers that are manufactured and contain nutrients in more or less exact amounts.

Mineral, or inorganic, fertilisers

Mineral fertilisers include:

- **Dolomite:** Dolomite raises the pH of soil, so only use it if your soil is acid (for example, with a high clay content) and you want to make it more alkaline. Dolomite is basically limestone, and gives your plants calcium and magnesium, two essential nutrients. You

can improve the structure of your acid soil with this because it helps break down hard soils to make them more friable and let air and water in. Dolomite can also make raw organic matter decompose more quickly.

You can buy dolomite in bags from your local nursery or garden centre. Follow the instructions on the bag to work out how much you need for your garden but, as a guide, you'll need between 60 grams and 250 grams per square metre, depending on the types of plants you have. Remember to water it in well.

- **Gypsum:** Gypsum is a soil conditioner, which means it opens up your soil to let air and water in; it also improves drainage and helps to fix boggy, waterlogged soils. Gypsum is calcium sulfate and sulfur, so it adds calcium to your soil, but it won't change the pH of your soil.

Bags of gypsum are available at your nursery or garden centre; make sure it's natural and not chemical gypsum for your sustainable garden. If your soil is clay with a hard crust, spread gypsum at a rate of 1 to 2 kilograms per square metre, dig it in to a depth of about 15 to 20 centimetres and water it in well. For other types of soil, follow the instructions on the bag.

- **Garden lime:** Garden lime increases the soil pH and helps improve the structure of your soil. Apply it two or three weeks before you apply any other fertiliser, and preferably in warm moist conditions.

If you have heavy clay soil, put on 500 grams per square metre. However, if your soil is lighter, use 200 grams per square metre. Always read and follow the directions on the bag. Remember, if you have acid-loving plants like azaleas or camellias, keep garden lime well away from them!

- **Granite and basalt dusts:** Granite and basalt rocks are ground to a very fine, powdery dust, which, when added to soil that has good amounts of organic matter and humus in it, can help the soil to release nutrients to your plants. The combination of basalt and granite can be a great all-purpose, well-balanced fertiliser, slowly releasing nutrients. As the fertility and biological activity in your soil gets going, the nutrients are released faster.

Your local agricultural supply store will stock this product. When you use granite and basalt dusts, you need to check your pH levels every few months to make sure you're not overfeeding your plants with any one thing. Read the directions on the bag and get to know your soil before using basalt and granite dusts.

- **Sulfur:** If your soil has a high pH (it's very alkaline) that you want to lower, you can use sulfur. Two kinds of sulfur are available — dusting sulfur and powdered sulfur. Apply powdered sulfur directly onto your soil at the highly technical rate of about a handful per square metre, and then rake it in. This should keep your garden going for about a year and your acid-loving plants, like azaleas, will love you. Dusting sulfur is not really for your soil; it's for your plants. You use it to control a number of diseases that affect plants in humid conditions.

Natural, or organic, fertilisers

All-purpose organic fertilisers are available in garden centres. Organic or natural fertilisers include:

- **Humus or compost:** People are sometimes confused about humus and compost. Basically, humus is the stuff you get after your compost has broken down. The process of composting produces humus. You know you've got humus because it has a sweet smell and is dark and crumbly. You can dig humus into your soil when planting and also use it as a rich, fertile mulch under leaf litter or bark mulch, for example. Humus helps to keep moisture in your soil when it's dry. If you can't make your own, you can buy humus in bags from the usual places. See Chapter 9 for more on compost and humus.

- **Animal manures:** The range of animal manures available for your garden is mind boggling. You can get everything from the more traditional cow and sheep manures to what is called 'Zoo Poo', which is a mixture of waste from all sorts of exotic critters! In some areas you can even get circus animal manure. I'm told by people who know about such things that there's quite a difference between elephant manure and giraffe manure.

Manure can help sandy soil retain water and even break up your soil if it's clay. Raw manure is best added in small amounts directly to compost. If your compost is between 10 and 20 per cent manure, the manure helps break down the plant material so your compost is ready more quickly. Use it sparingly if you put it straight on the garden.

Pellet-type manures, such as those from sheep and rabbits, make a good mulch because they're slow to break down. Make sure that your manure comes from an animal that hasn't been fed on hormones or other chemicals.

No matter what type of manure you use, it needs to be aged well. If it's

fresh, store it in a heap and keep it covered (to keep flies away) for at least three months. Fresh manure can burn your plants and can also be full of weeds, seeds and salts that wreak havoc in your garden. You can buy various aged manures in bags from your garden supplier. Always follow the instructions and wear gloves when handling manure.

- **Worm castings:** Worm castings — or *vermicasts*, as they are sometimes called — form one of the very best nutrient-rich soil conditioners and organic fertilisers around. The castings are actually the waste and broken-down organic matter the worms leave behind in a worm farm. Chapter 10 covers the process of making vermicasts in your own worm farm.

This stuff is fabulous! Worm castings are not only full of good food for your plants, they're teeming with tiny microbial critters and also worm mucus, which helps to retain plant food in the soil so it doesn't get washed out when the plants are watered.

- **Seaweed extract and fish emulsion:** Seaweed extract is amazing. Made from seaweed and kelp, not only does the extract provide a range of good food for your plants, it helps to protect them from pest and disease attack, produces more and better fruit and flowers, and is organic.

Fish emulsion is another great product that has the same properties as seaweed extract. However, it's made from introduced fish species that are considered pests in Australia and New Zealand. So not only is fish emulsion great for your garden, it's also helping to rid the waterways of nasty introduced fish.

Both these products come in liquid form and you can buy them from your local garden centre or from a hardware store; your local supermarket may even stock them. Some brands are packaged in a large plastic container, complete with a convenient hose attachment, and others in a bottle. Just follow the instructions and off you go.

Turning fish into fertiliser

Charlie Carp is a company based in New South Wales dedicated to protecting and improving Australia's waterways by controlling the European carp. This fish species was introduced to Australia in the mid-1800s and became a serious threat in the 1960s when a fish farmer illegally introduced a new strain. This nasty

fish has rapidly colonised inland waterways throughout the country. Up to 90 per cent of the combined weight of fish in Australia's inland waterways is believed to be European carp. Their feeding habits make the water muddy and undermine riverbanks, causing trees to fall and choke rivers, making life difficult for native fish such as the Murray cod, catfish and golden perch. To make matters even worse for these natives, the carp eat their eggs.

Charlie Carp removes over 150 tonnes of this menace every year and turns it into rich plant fertiliser and soil conditioner. I reckon that's a great solution to a pest problem that not only helps the waterways but also improves the soil.

For more information, check out the website at www.charliecarp.com.

- **Blood and bone:** Blood and bone is a great food for your plants. The blood bit gives your plants nitrogen to encourage good leaf growth, and the bone bit provides phosphorus and calcium for all-round strong, healthy growth. Blood and bone releases the goodies slowly to your plants, helps improve the structure of your soil, and encourages the good soil microorganisms and lots of worms. Blood and bone is best added in small amounts directly to compost; use it sparingly straight on the garden because it's not balanced in nutrients.

The quantities you need to use depend on your soil. When you bring your bag of blood and bone home from the nursery or hardware store, make sure you follow the directions.

- **Wood ash:** Many people who have open fires have a lot of ash that they're not sure what to do with. Wood ash contains calcium, potassium and magnesium, and other trace elements that are good for your plants. You can also use wood ash to deter pests and diseases from your garden. Because wood ash is still in the process of breaking down, it's best added in small amounts directly to compost; use it sparingly if you put it straight on the garden.

However, before even thinking about adding wood ash to your garden, check the pH of your soil first (check the section 'Pondering soil pH' earlier in this chapter). Because of the calcium wood ash contains, it's high in carbonates; this is great for raising pH if you have acid soils and want to change them — add about a kilogram per square metre and rake it in well. But if you have alkaline soil, don't add wood ash at all.

Anyone for tea?

Your plants enjoy a good cuppa from time to time. They like nothing better than tea made from fresh manure. Get a plastic rubbish bin or other container of

similar size with a tight-fitting lid, then half fill an old hessian sack with the manure and tie it at the top to make a big tea bag. Lower the bag into the bin and fill the bin with water. Leave it to steep for a day, a week, a month — whatever you like.

When you're ready to give your garden a wonderful treat, dispense the tea from a watering can that you've filled up from the bin. The ideal brew is the colour of weak black tea. Just keep topping the water up in the bin. Over time, the tea begins to look a bit too pale, so chuck the manure into your compost and make a fresh batch of tea.

You can even make a worm compost tea that your plants will also love. Steep some worm castings in water for an hour or a day or for however long suits you, and then pour it on your garden for a quick, nutritious liquid fertiliser. See Chapter 10 for more on worm farms.

Finding the best way to feed native plants

Many Australian native plants have evolved to survive in Australian soils, which in many cases are naturally poor and low in phosphorus. However, they can adapt to and thrive in improved garden soils — think of plants in natural bushland, which can be sparse and straggly, then look at the same plants in a well-tended garden with improved soil. The sidebar 'Feeding Aussie native plants' gives you an idea of what to use.

Australian native plants are happier if you avoid mushroom compost and poultry manure. Your ideal native fertiliser should have an NPK (percentages of nitrogen, phosphorus and potassium — refer to 'Getting to know plant nutrients' earlier in this chapter) of about 8:1:5. However, get to know the pH of your soil before you put any of these fertilisers on natives. Fertilisers are good at changing pH levels, which is great if that's the outcome you want, but not so good if it's not. For more information on how fertilisers can change the pH level of your soil, refer to 'Pondering soil pH' earlier in this chapter.

Some New Zealand soils are rich in nutrients and very fertile, such as those around volcanoes; whereas some are poor, sandy and infertile, such as those formed from the sedimentary rock known as *greywacke* that most New Zealand mountains are comprised of. Get to know your Kiwi natives and which part of the country they're from. If you plant natives from your area, chances are they'll already be adapted to your

soil and won't need any additional feeding. However, all plants appreciate a top-up of humus from time to time.

Feeding Aussie native plants

You can get a variety of fertilisers for natives from the garden centre. However, you can also buy the raw materials to make your own. Here is the recipe I use, which you can mix up in a bucket or in a wheelbarrow:

One part sulfate of ammonium

One part sulfate of potash

One part blood and bone

One part sulfate of iron

'One part' could be a handful, shovelful or a whole wheelbarrowful. It doesn't really matter; as long as you make a sufficient quantity for your garden.

Chuck a couple of good handfuls per square metre over the top of the soil. You can dig it in with a fork if you like; otherwise, just spread it evenly over the soil. Either way, make sure to give it a good watering so it's nice and damp.

Chapter 3

Water: Liquid Gold

In This Chapter

- Working out how much water you have and how good it is
- Working out how often to water
- Sorting your way through tanks
- Getting to know recycling methods

Water! It's the topic on everyone's mind nearly all of the time. I'm told that some city folk take water for granted, not ever thinking about where it comes from. You just turn on the tap and out it comes, right? Well yes, kind of. But do you stop to think about how it gets to your kitchen tap — where it comes from, where it's stored and how much you're actually using at your place?

If you live in a country area, you're particularly reliant on your water supply falling from the sky to fill your dams and tanks. Water is something you think about more often. If the dam's low and the tank runs dry, what can you do? The garden is the first to go in that situation; precious water is conserved for the household and maybe the stock. Or is that the other way around? I know a bloke who, when the current south-eastern Australian drought started to really bite, was heard to say the sheep would get the water before the wife and kids! Not sure if he was actually joking at the time. Farmers can be pretty attached to their sheep.

Whether you have an abundance of water or you're conserving every drop, without the right amount of water, your sustainable garden, and you, won't survive.

In this chapter, I tell you about the role of water in your sustainable garden and how you can keep your garden looking fabulous by understanding how much water you really need to give it. I show you how to work out the difference between good and bad water, and how to find out about the water quality in your area. I also let you know about some of the great water-saving initiatives being carried out by

some innovative communities.

Later in the chapter, I talk about tanks and water harvesting, exploring some of the tanks available and the pros and cons of installing a tank at your place. Finally I explore some water-recycling methods that might be useful for you as a sustainable gardener.

This chapter helps you really understand the importance of water and how all people can do their bit to use it wisely so they can continue to garden sustainably for generations. Quite simply, no matter where you live, if you reduce your water use, both in the house and in the garden, you spend less on your water and energy bills. And everyone reducing water use will alleviate the need for huge government spending on infrastructure such as dams, pipelines and desalination plants. You'll be doing yourself and the environment a big favour!

How Much Water Have You Got and Is It Any Good?

To work out how much water you have can be very simple. One way is to look at how big your tank is and whether it's full. If you have town water, you may think you have all the water you could ever need, with no reason for you to conserve it. Perhaps that's so but, in my opinion, just because you have water doesn't mean you should use as much of it as you like, whenever you like.

Here are some water facts to think about:

- The average person can survive for about 60 days without food, but less than 7 days without water.
- Around 80 per cent of the Earth is covered by water or ice. About 97 per cent of the Earth's water is the salty oceans and 2 per cent is ice, but only 1 per cent is suitable for use by people.
- On average, the human body loses up to 3.5 litres of water a day.
- Water can flow out of the average household tap at a rate of 20 litres per minute!

- A typical household can use over 650 litres of water each day. That's about 240,000 litres per year, and up to half of that goes out as wastewater!

- The percentage of household water that is used in the garden and for other outside uses, like washing the car and even hosing the driveway, is about 35 per cent, or 94,500 litres every year. Much of that water use is unnecessary.

Of course, not everyone uses that much water; not everyone has that much water available. Depending on the region you live in, you may be on one of the various levels of water restrictions and, of course, you always abide by these. Because of the strict rationing of water in some places, gardens are seriously under stress, or even dead.

When I was a youngster, where I lived had a plentiful water supply. Gardeners wouldn't think twice about turning on the sprinkler day after day in the heat of a summer afternoon to keep the lawn lush and green even in the driest of months. We kids would chase each other about with the hose! No-one seemed to care, as long as we didn't tramp into the house all wet.

Lots of areas have a seemingly plentiful supply, whereas others are on harsh restrictions. Stage 4 restrictions are common in the eastern parts of Australia. Restrictions can range from Stage 1 to Stage 10, depending on where you live. For detailed information on what the staged restrictions mean for you, contact your local water authority.

To be a sustainable gardener, learning to use only the amount of water you really need is important. Get to know your plants and your soil, and use water like the scarce, finite and precious resource that you know it is.

Working Out How Much You Need

To work out how much water you need, you need to know how big your garden is, what type of soil you have (refer to Chapter 2), what type of plants are growing and what your climate is, as well as the annual rainfall and evaporation rate. Sounds simple really.

Ask yourself if you need to water your garden at all. Watering, or irrigation, is the technical term for artificially applying water to your soil.

Start with good, fertile, free-draining soil that holds on to whatever moisture it gets and uses it wisely, and you may not even need to water very often, if at all. This is by far the best and most efficient and sustainable way to ensure you get the most out of every drop of water you have available to you. Learn about the rainfall in your region; can your garden live off the sky? Being sustainable is all about making the most of what you have and conserving all of the Earth's precious natural resources.

How much water you think you need and how much you actually need may very well be quite different. Think about when you water and how often you water.

Water in the cool of the morning rather than the heat of the day. In the morning, the sun is low and the wind is usually lighter. Watering in the evenings doesn't give the plants time to dry out and you may just find yourself with a huge outbreak of some nasty fungal disease to deal with. Dig down into your soil to see if it's actually moist, before you get the hose out. Maybe you're watering out of habit rather than necessity.

Only water things that grow — that means don't water your path, driveway or walls. If you're using an irrigation system, make sure the water is going where it is meant to. Adjust the sprinkler heads if you can, so that you have large droplets of water rather than a fine mist that evaporates or is blown away.

Telling the difference between good and bad water

Isn't all water the same? If you look at it in a clear glass, it looks pretty much as you would expect, doesn't it? Well it may look like sweet,

clear water, but how good it is for your sustainable garden can depend on a number of factors, such as:

- Where the supply comes from
- If it's high in minerals, such as iron
- If it's salty — water in some parts of Australia comes from bores or dams and is higher in salt than the sea

Your water supply may come from several sources, depending on where you live, including:

- The local town or city supply
- A bore, either one you've sunk on your own property or the town bore (you know the one!)
- A spring
- A desalinated supply
- Tanks

No matter where it comes from, if you're not sure of the quality of your water, your local water authority will usually do a basic test for you, often for free. Give the office a call to ask if they do testing; if not, they'll be sure to know where you can get it done.

A basic water quality test checks for salt, mineral content and the pH (refer to Chapter 2 for information on pH levels). The results of this test help you determine if your water is of good enough quality to maintain your sustainable garden. Ideally you want a fairly neutral pH of around 6 to 7, and less than 300 parts per million of salt. Some water is high in minerals such as iron. If yours is high in any sort of minerals, finding out the plants that are best suited to the mineral content of the water in your area is a good idea. Ask your local nursery for advice, or look around the neighbourhood to see what grows best in other people's gardens.

How often is too often?

The amount you should water depends on a number of factors in your garden. Number one is the rainfall in your area. A sustainable gardener should design and build a garden with water needs replicating the natural rainfall as close as possible. Putting in a water-wise, drought-tolerant garden using plants from low-rainfall areas has

no point if you live somewhere that has an average rainfall of a metre! Gardeners all love to have as big a range of plants as possible because, let's face it, gardeners love plants! But, as a sustainable gardener, you need to show restraint. You need to understand your climate, soil, sun, average annual rainfall and evaporation rates to use only the water your plants need.

Good design ensures you zone your plants according to their water needs in your sustainable garden. Don't plant two species half a metre apart that need totally different amounts of water. Don't laugh, I've seen it done far too many times.

Practise *hydro-zoning*; that is, don't create zones in your garden simply according to the usual 'sun, part-shade or shade' criteria. Plant according to water needs and put the plants that need the most water, maybe your vegies, all together. It makes sense, your plants are happier and you use less water.

The popular school of thought is that if no significant rain has fallen for a week, then you may need to give the garden a drink. But, of course, you can only do that if you have your own water source or are not subject to local restrictions.

A long, deep soak once a week or so is much better for your plants than a quick sprinkle with the hose every day. Shallow watering encourages shallow roots. If you make a habit of watering this way, your plants will send their feeder roots searching for moisture up near the surface of the soil, and become dependent on that little quick sprinkle. If you forget to water or you can't water because you haven't been using your water sustainably and you've actually run out, your plants will turn up their toes very quickly.

By watering well, but less often, you encourage your plants to send out deep roots to catch the moisture deep in the soil. Add to this watering practice a good layer of mulch on your garden to help hold the water in your soil and you're well on your way to sustainably managing the water needs of your garden. To learn more about mulch, have a look at Chapter 9.

Considering irrigation systems

To water effectively and to try as much as possible to replicate the natural rainfall at your place, consider an irrigation system. A mind-boggling array of irrigation systems are available these days. Domestic irrigation has come a long way from the old garden hose that kinked all the time, with the sprinkler at the end that sprayed a fine mist of water into the air. Not much actually seemed to get onto the garden where it was intended to go. Great fun for jumping in and out of on a hot summer's day when we were kids though! Those types of sprinkler can lose up to 60 per cent of the water through evaporation and simply blowing away in the wind. The result can be just as pointless as a quick, shallow sprinkle with the hose.

If you like using sprinklers, consider buying one of those available that aim to replicate natural rainfall. The low-throw, 'wobble head' sprinklers throw out quite large droplets of water low across your yard and, if you have mains-pressure water, you only have to turn the tap on about half a turn for them to be effective. These little beauties are even designed to work on gravity-fed systems. That means if your water comes from a tank and you have no pressure pump to move it around your place, you can still use one of these sprinklers on your garden.

If you're planning to use an irrigation system at your place, get the best and most efficient system you can afford.

Irrigation systems can be as simple as a hose or as complex as a built-in underground system of pipes, solenoids and pop-up sprinklers, all operated on a timer by a sophisticated computer you can turn on to water your garden in Christchurch from your villa in the south of France. Like most things, it depends on your bank balance and how far you want to go to get the perfect system.

You can get *weeper hoses*, or leaky or porous hoses, as they are also sometimes called. These devices are made from recycled rubber, attach to your hose and sit underneath the mulch on your garden beds. Water weeps out of them when the tap is turned on only a bit. They don't use much water but, depending on your soil, you may only get water 10 centimetres either side of the hose, so you need to plant close to it for maximum benefit.

Drippers or *upright micro-sprays* attached to poly pipe and run around the garden make for a good, cheap watering system. Just be aware that the tiny little holes in the drippers can easily block up because they lie on the surface of the soil, usually under the mulch, and, unless you check them regularly, the first sign of a blockage could be a dead or dying plant. Upright micro-sprays should stand from 10 centimetres to 30 centimetres above your garden bed. Higher than that and the fine mist of water can blow away and be wasted. Because the holes for the water to spray out are so tiny, impurities in the water or even insects or spider webs can block them.

Whatever irrigation system you have, make sure you watch the weather. You've probably seen sprinklers on a timer system come on in the middle of a rainstorm. In many areas, all automatic sprinkler systems must be fitted with a rain sensor to stop that sort of waste.

No matter what sort of watering system you use, make sure you use the right amount of water for your garden. Don't kill your garden with kindness or make it dependent on water by overwatering. Try to replicate the natural rainfall of your place and make your watering regime as close to nature as you can.

Harvesting Rainwater with Tanks

Some of you city folk may remember days gone by when water wasn't taken for granted, when what you had fell from the sky, hit the roof and ran into your tank, or tanks, to be stored for everyday use. That water came out of the tap not with a great gush, but sometimes at a bit of a trickle. Particularly if you had a gravity system, with a header tank up high on a stand and the force of gravity sending the water down into the house and out of the tap. During long, hot summers the kids were all thrown into the bath together once a week or so to give 'em a scrub, while still conserving precious water, and then the bath water was collected and thrown on the vegie garden or saved for the weekly clothes washing.

Actually, those days really aren't so far away. I know lots of people who still live that way. Particularly in parts of the world affected by

drought. Tanks used to be commonplace and were either galvanised iron or concrete. Almost always they were round, were filled from the roof of the house or sheds or both, and what went into them was rarely filtered. Possum poo, leaves, the odd dead bird — in they went and we still drank it!

These days there is a tank to suit every occasion, in all sorts of sizes, shapes and colours, and made from all manner of things. I won't even try to introduce you to every type of tank on the market. If you want one at your place, in this section I give you some good tips so you can do some research of your own to get the right tank for you. But first I have a look at how much rainwater you're able to harvest and how much you need, and therefore how big your tank needs to be.

How long does a tank of water last?

Predictably, how long your tank of water lasts depends on how big it is and how much water you use.

When you're deciding what size tank to get, you need to first bear in mind how much space you have for it and exactly where you want to put it. Here are a few things to consider:

- Do you want your tank below or above the roof line of your house? If your site is sloping, this will make a difference to its placement. Installing your tank on the lower side of your site is easier.
- Do you want the tank above or below the ground? If you want it below ground, you may need a digging machine big enough to dig the hole. Will the machine easily access the tank site? Depending on the size of the tank, it could take a while with a shovel. Although I do know a woman who dug a hole and buried a 5,000-litre tank herself, because it blocked her view from the kitchen window!
- Is the site close enough to downpipes to feed the tank, and to stormwater drains to take the excess when the tank is full?
- How many tanks do you want? Do you want to add more later?
- How much site preparation will be required?

When you're working out how much water you need to maintain your sustainable garden, and therefore the size of tank you need (given

that you have the space for it), here are a few more questions:

- What are you intending to use the water for, and how often?
- How much water do you think you'll use?
- What is the average rainfall in your area?
- How big is the area of your roof that you're able to harvest water from?

To work out how much tank water you think you'll use, you need to have a good look at your current water use. If the tank water is only for the garden and you're already practising sustainable gardening principles by planting species suited to your soil, climate and rainfall, you may not need very much water. However, if you're planning to use your tank water for the general household as well, you'll need to:

- Work out how often the people living at your place shower and for how long.
- Establish how much water you use in the house for washing, cleaning, cooking and so on.
- Install as many water-saving devices as you can, if you don't already have them.

If you're on mains water, have a look at your water bills to see how much water you use during different times of the year. Your local water provider should have good general information on how much water an average household in your area uses and what it's used for. You may be surprised how much water is used inside the house.

Knowing the average rainfall of your region can also help you work out how big a tank you need. You should be able to get hold of the average rainfall information for the last 100 years in most areas by contacting the Bureau of Meteorology in Australia or MetService in New Zealand. Figures 3-1 and 3-2 show rainfall charts for New Zealand and Australia respectively. In Australia, check out www.bom.gov.au. For New Zealand, go to www.metservice.co.nz.

When working out the average rainfall, also find out the usual longest periods without rain in your area, so you know how much water you need to cover the dry period and what sort of tank capacity you require to collect it. Ideally, you need to know when it actually rains in

your neck of the woods so you can work out when you'll harvest the most water for use in the dry periods. If you understand the seasons — knowing when it's wet and when it's likely to be dry — you can work out how much water you can use from your tank to ration it out through the lean times. That's if it does, in fact, rain where you are!

How big is your roof and how much water can you catch from it? Shortly I give you a formula to estimate your roof's capacity to collect water for your tank, and a couple of other formulas as well. But, to start with, be sure that your roofing material is safe for collecting good-quality water. An asbestos roof, for example, might not be such a good idea for collecting rainwater. And older homes typically used lead flashings to seal roof areas — if yours hasn't been replaced with aluminium, you may want to consider any runoff and its possible consequences. Another thing to consider is possible 'fall-out' if you live in a heavy-industrial area or near a very busy road.

Figure 3-1: Some areas of New Zealand receive more than 4,000 millimetres of rain in a year.

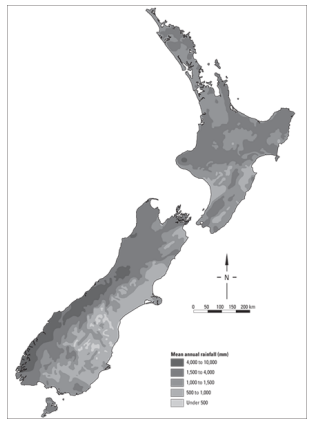
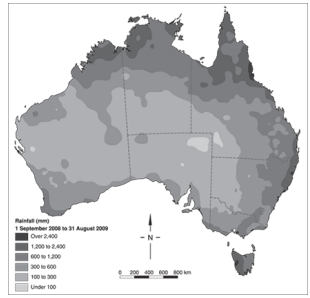


Figure 3-2: Australian rainfall is widely variable because of the range of climatic regions.



Also make sure your gutters are in good order and are clean and clear of any leaf litter or other rubbish that can accumulate up there. If you're intending to harvest rainwater from your roof, cleaning your gutters regularly is a good idea. Also consider installing some sort of gutter protection system to stop stuff clogging them up.

If your roof has eaves, the roof area of your house is usually bigger than the floor area. That's if it's a single-storey house, of course. Because roofs are usually pretty big, you can catch a fair bit of water from one! Remember also that the area of roof that can collect water is only that area that feeds the downpipes that feed your tank.

To work out how much water you can collect from your roof, here's a formula to guide you:

1 millimetre of rain = 1 litre of water collected per square metre of roof

So that means, if you get 55 millimetres of rain and the area of your roof that you're collecting water from is 250 square metres, you should expect to collect 13,750 litres of water in your tank:

55 millimetres × 250 square metres = 13,750 litres

That's if your tank holds that much.

Now, to work out just how much rain you could potentially collect in a year, which will give you an indication of the size of tank you need, use this formula:

Roof area × annual rainfall = maximum amount of water available for

harvest

So, with a roof area of 250 square metres, and assuming an average annual rainfall of 1,200 millimetres (which is the average for Brisbane), you should be able to collect 300,000 litres over a year:

250 square metres × 1,200 millimetres = 300,000 litres

So, if you have a tank with a 10,000 litre capacity, you can potentially fill it and use it 30 times in a year. However, during a dry spell, you may need more than your tank's capacity before the rains come again to refill it.

To work out how much water you need to get you through a dry spell, use this formula:

Maximum consecutive days without rain × average daily water use = storage amount required on day one of the dry spell

For example, if the maximum dry days is 40, and your average daily water use is 400 litres, the volume needed on hand on the first day of the 40-day period would be 16,000 litres:

40 days × 400 litres = 16,000 litres

Meeting this requirement is much harder than it may seem. Often your dry period will begin when the tank isn't full. And predicting your water use, like predicting actual rain, is not an exact science by any means. So just use this method as a guideline.

Ideally, plan to add another tank later if you find you're not able to harvest enough water for your needs.

Determining what sort of tank you need

What sort of tank you want, what sort of tank you need and what will actually fit at your place may be very different things indeed! You need to do a bit of groundwork before you make your final decision. After you weigh it all up, you may find you don't actually need a tank at all.

You first need to think about what you want to use your rainwater for, such as:

- To water your garden sustainably
- To top up the pool
- As a backup in case of fire
- To flush your toilet
- To run your washing machine
- To use as drinking water
- To plumb into your entire household system

And the reasons you want to harvest rainwater could be that:

- You don't actually have mains water.
- The council planning rules where you live say you must install a tank.
- You want to avoid water restrictions in order to use a hose or sprinkler outdoors at any time.
- You think rainwater is probably better for you than the stuff that comes from the tap.
- The stuff that comes from your tap is salty.
- You want to save money on water bills.

Rainwater harvesting can be a huge part of your sustainable garden, particularly if you live in a dry area and are on water restrictions. Harvesting and storing rainwater in the most efficient way is crucial. Unfortunately, whatever season it rains the most in your part of the world is when you won't be needing your harvested water on the garden, so having enough space to store the water to use when you need it most is vitally important.

No matter what size your tank is, you need to figure out what to do with the overflow. Some tanks are plumbed so that the overflow is diverted into the stormwater drains. Another good idea is to have your tank plumbed to your toilet, so that any excess water can be used to flush. The continuing insistence on using good-quality drinking water to flush down the toilet seems quite bizarre, when people in developing countries can't get enough fresh water to drink!

Huge benefits are gained in having a tank at your place and harvesting as much rainwater as you can, including:

- You rely less on mains water supplies.
- Reduced stormwater runoff, particularly in urban areas, may help stop pollutants entering the waterways and reduce flooding.
- Less money needs to be spent on new stormwater infrastructure or maintaining existing infrastructure, saving everyone money in the long run.
- You gain a better understanding of how precious water is.
- You use water wisely.

For those of you living in urban areas, the impact of development and the inclusion of so many unnatural hard surfaces has changed the lay of the land so dramatically that when it rains it pours! In less-built-up areas, when it rains, the water slowly filters through the plants and the soil, and trickles into stormwater drains, creeks, rivers and other waterways. In highly built-up urban areas, the water rushes off roofs, down gutters and roads into pipes and concrete channels. When it does hit the waterways, it hits hard and erodes the banks, silting up the water as it goes, destroying natural habitats for plants, animals, fish and other good guys, and carrying with it all manner of nasty pollutants, rubbish and weeds.

Harvesting rainwater at your place sounds like a pretty good idea then, doesn't it? Well, yes and no. The other side of the coin is that, in drier areas, harvesting as much rainwater as possible dramatically reduces what little runoff there is entering the waterways. Pollutants or not, every bit of water taken out of the system reduces precious environmental flows to creeks and rivers — a dilemma for every environmentally aware sustainable gardener.

In some areas you can get a government rebate if you buy a tank. Just make sure you have it installed by a licensed plumber though. Check with your government water agency, local water authority or council to find out if you qualify.

So, after all that, you decide a tank, or, to be trendy, a *rainwater harvesting system*, is for you. You can't really just bung a tank in the backyard, connect it to the downpipe from your roof and water away. You need to figure out how you're going to get the water out again so you can use it where you want it. To do that, you need a bit of a

system. A rainwater harvesting system could be anything from a tap at the bottom of your tank and a bucket to an automated system with pumps to divert the water anywhere you want, when you want it there.

To work out what you want from your system, think about whether you want some or all of these items:

- Water filters to prevent dirt and leaf debris slipping into the tank and to prevent mosquitoes using it as a breeding ground
- *First-flush diversion*, where the first rush of dirty water from the roof is diverted into a separate pipe and not into the tank
- A diverter that, if you've plumbed any part of your house to use tank water, gives you the ability to switch easily to mains water if the tank runs dry
- A pressure pump to ensure you can get the water to where you want it

The system you end up with depends entirely on what it is you want to achieve at your place and, of course, your budget. Discuss what you want to use the stored water for, and why, with the tank supplier and the plumber beforehand to make sure you get the system that delivers what you need. But most important of all is: Where are you going to put your tank? How big is your backyard and will the tank of your dreams actually fit?

Following are a few of the different tanks available that you may want to consider.

Steel tanks

Steel tanks, such as those shown in Figures 3-3 and 3-4, range from 200 litres to 20,000 litre capacity. They are made from corrugated steel and come in a range of colours, sizes and shapes to match your outdoor decor! The environmental footprint of these tanks is pretty small due to the low emissions produced during their manufacture. Most areas have local manufacturers of steel tanks, so you can reduce emissions by not needing to transport them across the country to your place. They are relatively easy to install on a level surface, usually being supplied with their own stand.

Figure 3-3: The classic corrugated-steel tank.

Figure 3-4: Slimline steel tanks can fit neatly into your landscaping.

Poly or plastic tanks

The capacity of poly or plastic tanks, made from food-grade polyethylene, ranges from 600 litres to 50,000 litres, which is pretty big — not for the average garden! They come in a mind-boggling array of colours, sizes and shapes.

Flat poly tanks, such as the one shown in Figure 3-5, are great for small spaces. They can be used as a garden wall, or secreted away in that narrow space down the side of your house. You're limited here to about 3,500 litres — any bigger and they're just not strong enough. Flat tanks can sit happily on level concrete or paving. But they also need to be braced; otherwise they might just tip when they're full!

Round poly tanks (see Figure 3-6) can sit on a well-prepared base of crushed rock and sand (sometimes known as road base) or on a properly prepared concrete slab. Check with the supplier or installer which suits your site best.

You can even get 3,500-litre poly tanks, either round or flat, depending on your space, designed to sit underneath your driveway or paths. Ideal if you're building or renovating and don't have space for an above-ground tank. Some of these systems are designed to join a number of tanks together so you have even more storage capacity.

Figure 3-5: Poly tanks are available in flat designs to fit into tight spaces.

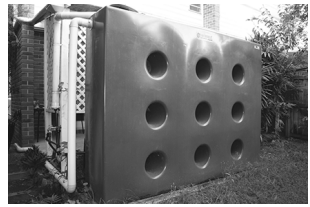


Figure 3-6: Round poly tanks are very popular, but require a properly prepared base for stability.

The downside of poly tanks is their fairly dubious environmental credentials. Let's face it, plastic is made from fossil fuels, and making plastic produces significant greenhouse gas emissions. Also, they're not too flash in a fire; plastic tends to melt!

Concrete tanks

Concrete tanks (see Figure 3-7) generally range from 3,700 litres right up to 500,000 litres of water storage, so, if you have the space, you can have a really big tank. They are made from steel reinforced with, of course, concrete! They are usually built on site and can be built under the ground so they don't blight the landscape. Concrete tanks last and last and last — and, if they do spring a leak, they're relatively easy to fix. Be careful if you're planting trees nearby, a crack in your tank can be an invitation to a tree to send its roots in looking for water.

The environmental footprint of your concrete tank can be a bit scary! Because they use both concrete and steel, they rate the highest of all the currently available tanks for the greenhouse gas emissions

produced in their manufacture. Despite all of this, the concrete and steel *is* recyclable.

Figure 3-7: Concrete tanks can be dug into the ground to make them less conspicuous.

Bladder tanks

The capacity of these tanks ranges from 300 litres to 20,000 litres. Bladder tanks (see Figure 3-8) are basically like giant waterbeds! They're made from flexible reinforced polyvinyl chloride (PVC), which is not really a good environmental choice. PVC is made from oil and chlorine, which are not environmentally sustainable or friendly.

Bladder tanks are designed to sit on top of the ground under your floor or deck, providing the clearance is at least 750 millimetres. Some are like long thin sausages designed to fit between the stumps of your house, so you can make the whole space under your place a giant reservoir. They sit neatly out of sight and are pretty easy to install. Don't expose them to sunlight as the PVC is liable to start to break down if it gets too much sun.

These bladder tanks have a limited life, usually with a five-year guarantee, and PVC tends to take a very long time to break down in landfill. Less than 1 per cent of a bladder tank is recyclable, so it may very well end up there. They may be cheap, but think about the long-term costs.

Figure 3-8: Bladder tanks are like giant waterbeds that you can install under your house or deck.

Recycling Water

Using recycled water is a good way to conserve precious water resources. But what exactly is it? Where do you get it and how can you use it?

Basically, recycled water can be stormwater, greywater or wastewater (sewage, also known as blackwater), which, when treated, is known as *effluent*. Read on to find out more about these terms and what they mean for your water use plans.

You can use recycled water to irrigate paddocks and crops, in a greenhouse, on public parks and sportsgrounds, for industry and, of course, in your sustainable garden. Great debate surrounds the use of recycled water as drinking water in Australia, though parts of Europe are already doing so, but in times of sustained drought, it may become inevitable. Recycled water is a valuable resource that should be utilised more. If everyone gets used to the idea of using more and more recycled water wherever it can be used, more precious drinking water will be conserved.

In many areas, the use of recycled water is already commonplace to keep parks, sportsgrounds and particularly golf courses looking lush and green year round. At your place, you can use recycled water to flush the toilet and water the garden.

According to Melbourne Water, less than 10 per cent of the water used in urban and industrial settings is recycled. Melburnians use about 485,000 million litres of potable water each year!

Much of that water could be substituted with recycled water, because it's used for purposes that don't really need good-quality drinking

water, like washing the clothes, flushing the toilet or watering the garden. Water recycling is a socially, environmentally and economically viable solution to help preserve precious drinking-water supplies.

Water treatment

In most cases in Australia, the use of recycled water supplied from sewage or stormwater treatment facilities depends on the level of treatment it has had.

In Australia, recycled water is classed according to the amount and type of treatment it's had. New Zealand uses a similar classification system; for more information, contact your local water authority.

Class A water

The highest quality recycled water is classified as Class A, and has undergone a tertiary treatment process and pathogen removal. This water has been deemed safe to use on food crops, even those you can eat raw. You can use it for all sorts of things:

- Watering your garden
- Toilet flushing
- Process or cooling water for industry
- Fire-fighting
- Air-conditioning
- Watering municipal parks and sportsgrounds
- Topping up contained wetlands or filling ornamental ponds or fountains
- Irrigating food crops that are consumed raw or sold to consumers uncooked or unprocessed
- All of the uses listed for Classes B, C and D

Class B water

This water is from a secondary treatment process where only some of the pathogens are taken out. If you manage this water pretty strictly,

you can use it for:

- Drinking water for livestock, excluding pigs
- Irrigating dairy paddocks
- Washing down dairy sheds and stockyards (not including milking equipment)
- Urban (non-potable) uses with restricted public access
- Closed industrial systems
- All of the uses listed for Classes C and D

Class C water

This water goes through a secondary treatment process with minimal pathogen removal. With strict management practices, you can use it for:

- Watering human food crops that will be cooked or processed
- Watering selected crops that will be consumed raw or unprocessed and are not directly exposed to the water (such as apples)
- Irrigating grazing land or fodder for cattle, sheep, horses, goats, pigs and so on
- Irrigating grazing land for dairy cattle (subject to a five-day withholding period after irrigation)
- Urban (non-potable) uses with restricted public access
- Closed industrial systems
- All of the uses listed for Class D

Class D water

The treatment process used for this level of recycling means you can only use it for non-food crops, such as woodlots, turf growing and flowers.

Greywater

So what sort of water are you going to use at your place? Most

probably the recycled water you'll use in your sustainable garden is water you've harvested from your roof in your rainwater harvesting system — your tank. Or water you've collected in your dam, if your place is that big!

However, one category of recycled water you may use on your garden is greywater. Before you even think about using greywater you need to know a few things.

Greywater is defined as all of the waste that comes from your bathroom, laundry and dishwasher. In fact, any water that is used inside your house except the water from the kitchen sink and the toilet. That water is called *blackwater* (or *wastewater*), not because it's actually black, but because it has all sorts of contaminants in it. According to some figures, households in Australia and New Zealand can use up to 400 litres of good, clean drinking-quality water a day that ends up as greywater.

Diverting this water onto your garden must sound like a good idea; however, not a lot of research has been done yet on the effects of greywater. You need to bear in mind a number of aspects of greywater before you settle on a greywater system:

- You can't store greywater for more than 24 hours.
- Because greywater may contain high levels of potentially dangerous bacteria and other pathogens that may be spread by water droplets, you need to divert your greywater around the garden using subsurface irrigation. It doesn't have to actually be under the ground; under a thick layer of mulch will do.

- You need to think about the detergents, soaps, shampoos or any other cleaning products you use. Many detergents have a high salt content that can spell disaster for your soil and your plants. Check for high phosphorus content also, and think about changing brands to something less damaging if your usual brands have high salt or phosphorus levels. You can get some good information on phosphorus and salt levels in various popular detergents from www.lanfaxlabs.com.au.
- You should consider starting slowly, perhaps trialling a patch of your garden with greywater first, and watch for any changes in your plants.

You can divert greywater untreated to your garden through very basic direct diversion systems or use quite sophisticated domestic greywater systems that give the water Class A treatment. The choice is only limited by your bank balance.

- **Untreated systems:** In these systems, the greywater is collected only from the bath, shower or laundry rinse cycle. It then goes to a storage tank to be pumped through a filtration bed of gravel and sand. As the water percolates through the bed, the large contaminants are filtered out. The water ends up in a holding tank and is pumped onto your garden. Remember, you need to get it onto the garden using subsurface irrigation. And don't ever use untreated greywater on the vegie garden.

- **Treated systems:** These much more high-tech systems give you Class A water that you can safely use on your sustainable garden (though still through subsurface irrigation and not on your vegies), in the washing machine and, of course, to flush the toilet. A system like this needs to be installed by a licensed plumber experienced in greywater, and in most areas you probably need a permit.

Ask your local council or relevant government authority before installing a greywater system.

Using greywater can be a good way to save precious water and not have to restrict watering your garden, particularly in areas of low rainfall. But be careful; the most common mistake with greywater is overuse. By putting only greywater on your garden, you may start to damage your soil and its microorganisms.

Not a great deal of research has been conducted on the effects greywater might have not only on plants, but on soils and all the friendly little soil microbes. I reckon the jury is still out on this one. If you're using greywater on your garden, try to alternate the greywater with some tank or town water if you can.

Greywater use has real potential to increase the *salinity*, or salt content, of your soil by not only adding salts from the detergents you use, but by raising the *water table*, the level of the water-soaked section of earth under the ground. This brings natural salts in your soil to the surface and can have catastrophic effects on your healthy soil and your plants. Very few plants tolerate high levels of salt, either

in the soil or carried by the wind. Do a web search for salt-tolerant plants to help identify those suited to your area, or ask at your local nursery.

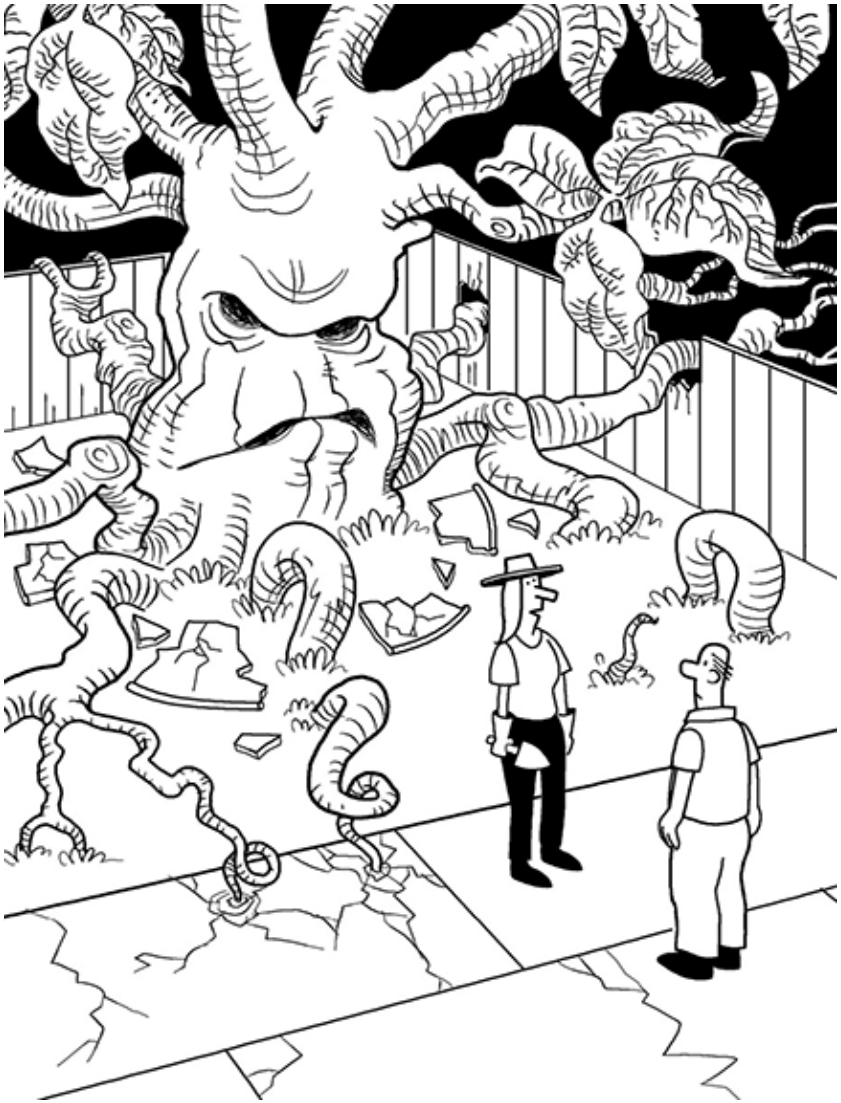
Don't use greywater unless you are absolutely, positively certain that no pets or children will come into contact with it, that it will always be distributed subsurface, that you never irrigate edible plants with it and that your system purges the storage tank every 24 hours.

In areas of drought, in particular, the media has promoted the use of greywater as the saviour of parched gardens. In some urban areas, soils and plants are starting to show some alarming levels of salt build-up. If you need to use greywater, maybe confine it to your lawn until the scientists work out the best use for it.

Part II

Designing a Sustainable Garden

Glenn Lumsden



‘We need a bigger pot for the Patagonian goat-strangling tree.’

In this part . . .

Good gardens start with good design.

I start this part by leading you through the process of gaining a good understanding of the environment you live in, and how to create a sustainable garden that suits your place rather than one that fits the latest garden fashions. Sustainable garden design is not about fashions or fads; it's about designing the best garden for you, with minimal impact on the surrounding environment and this precious planet.

I take you through the principles of sustainable garden design, give you some great tips on choosing the right plant for the right place and some guidelines on drawing up your plan.

Finally, I explore the sustainable credentials of some of the more common landscaping materials. Do you know where your pots come from and how big a carbon footprint they have?

Chapter 4

Understanding Your Existing Space

In This Chapter

- Critically appreciating what you have
- Talking a stroll through the neighbourhood
- Defining the purpose of your garden

A good sustainable garden starts with good design. Whether you employ a professional designer or do it yourself doesn't matter. You need to understand your space. In this chapter, I show you how to really look at your yard from both inside and outside your home.

Taking a walk around your neighbourhood is not only good exercise, it helps to give you clues about what grows best around the area, and you can get to know the neighbours.

I'm sure your aim is to create a wonderful, sustainable garden. That's why you're reading this book, right? The best way to achieve your sustainable garden goals is to get a clear picture of exactly what it is you want your garden to be. I lead you through some checklists to help you clarify the role and purpose of your sustainable garden.

Looking Out Your Window, What Do You See?

Creating a garden isn't difficult, but a well-designed garden takes time, thought, planning and a bit of research. But where to start?

Those in the trade call the starting point *site analysis*. What that means is taking a good long critical look at what you've got. Try to

walk around your garden and look at it as if you haven't seen it before (or pretend it's someone else's), and be critical of what you see. Take careful note of all the characteristics of the garden.

No hard and fast rules prevail here, and the following list could be much longer or much shorter, as every house and garden is different. What applies at your place might not apply to your friend's place down the road. Some things to consider include:

- **Size:** You may need to get the measuring tape out to determine how big your yard actually is.
- **Levels:** If you have a slope, how steep is it, which way does it face, does water run off it and where does the water go?
- **Drainage:** Do you have a well-drained site or is it a bog when it rains?
- **Soil type:** For some handy tips on how to work out your soil type refer to Chapter 2.
- **Direction:** Take note of the path of the sun and any existing shade from shrubbery, your house and the neighbours' houses, as well as where the prevailing winds come from, and remember these all change with the seasons.
- **What's there now:** Trees, shrubs, lawns, rubbish, shed, clothesline, playground, cricket pitch — the list goes on. You need to note everything on your block (not just the things you may want to get rid of), including the driveway and the fence, and how high it is.
- **The view:** Walk around your garden and take note of the views both inside the garden and outside. By careful plant arrangement you may be able to frame a lovely distant view from your garden. Now go inside and look out the windows of your home. Think about what the garden looks like from various rooms and how you might improve what you see.
- **Legal requirements:** In some areas, permits are needed before a tree can be removed, or even pruned, or the house and/or the garden may be subject to a heritage listing. Find out if that applies to your place before you start any work.
- **Services:** Where does the power, water, phone or gas come into your property? Note where any underground pipes or cables lie.
- **Paths:** Do you have a lovely sweeping curved path to the clothesline and a worn straight line of grass because nobody ever

uses the path? Remember, people and animals always take the most obvious, direct route!

- **Type of house:** What is your house made of? What colour is it? What period or style is it?

- **What parts are already sustainable:** If you're not starting from scratch, you may already be composting all your green waste or growing vegies in the corner. Good on you! Look around to see what other sustainable practices could be incorporated.

When you've collected all this information, what do you do with it? The best approach is to get yourself a piece of paper and a pencil and start drawing a plan. Read more about this in Chapter 5.

In the south, winter is the perfect time to start planning your new sustainable garden in front of a warm fire with a hot cup of tea. In the north, summer is good, when it's too hot to do anything else but sit in a shady spot with a long iced tea, dreaming about your new garden.

Make a list of all the features in your garden you enjoy. Then list all the things in your garden that annoy you, because they're not at all sustainable, or are just impractical or unattractive. Sometimes you only notice the most annoying aspect of your garden when you mow, for example. There may be a fiddly bit that's hard to get the mower around or, every time you mow, you whack your head on that low branch, and each time you tell yourself you'll cut it off next time. It may be that the tree is way too close to the house. Perhaps you have an arbour that was once beautiful but now it's tired and overgrown, or you long for a secluded 'quiet space' in your garden to while away sunny afternoons with a good book.

Think about the main problems that affect your garden. At my place it's strong, swirling, salty winds. At your place it may be poor soil or uninspiring views.

Understanding your site and conditions will make plant selection easier. Choosing the plants to suit your conditions is much easier than trying to change your conditions to suit the plants! Give

yourself time to appreciate every aspect of your garden, especially if you're new to the place or the area. Six months is good; a year is even better, so you appreciate the subtle changes from season to season.

When planning your sustainable garden, always be realistic about the time you have to maintain it. Designing and building a high-maintenance garden can lead to frustration and disappointment. If you can't maintain it, you may need to consider employing a gardener. If you do, always ask for references from potential gardeners, and ask them about their sustainable horticultural qualifications and experience. After all, you've put time and money into your sustainable garden; it's a valuable asset to your home and you shouldn't trust just anyone to care for it.

Checking Out Your Neighbourhood: What Grows Where?

If you're new to gardening or have just moved into an unfamiliar area, the best way to find out which plants do well is to go for a walk around the neighbourhood. Take a pen and paper or, better still, a camera. If you see a plant or group of plants that you really like but have no idea what they are, a photo can help you to work it out. Use the opportunity to meet the neighbours — gardeners usually love a good yarn over the front fence, especially if you're admiring their garden. They should be able to help you identify local plants.

Be aware that some plants that seem to be thriving, particularly in areas hit by drought, could turn out to be nasty weeds. Get yourself a copy of your council's environmental weed list, if they have one, to help you sort the good plants from the baddies.

You can get information from a range of places and people to help you decide what grows well in your area. Remember to ask them if they support sustainable gardening practices! Try a few of these information hotspots:

- **Your local council:** Start with your council's website. Some

councils have great local information on sustainable gardening and plant selection that's up-to-date and relevant for your area. You can even get brochures on local sustainable gardening practices, the nasty weeds of the region, water-wise information, and the local indigenous plants and animals. In fact, all sorts of great resources to help you start your sustainable garden and get to know your area.

- **Friends groups:** Some fabulous gardens, bushland and coastal areas have 'friends of' groups. These are local people with a wealth of local knowledge. Find out about your local friends group and join up.

- **Garden clubs:** In both Australia and New Zealand, garden clubs are all over the place. Check your local council or community directory to find one close to you.

- **Native plant groups:** The Australian Native Plants Society (Australia) (ANPSA, formerly ASGAP) and the New Zealand Plant Protection Society (NZPPS) are your best bets to find out about native plants in your area. You can find out more about these organisations at `http://asgap.org.au` and `www.nzpps.org`. Both groups have national networks and hold local meetings, national conferences and seminars, and all things in between, covering all sorts of information on growing native plants. Your local group will have members with vast local knowledge about what native plant grows where, as well as much wider networks and links to help you really get to know the locals, both plants and people!

Enough to have them certified!

Sustainable Gardening Australia (SGA) has accredited nurseries and garden centres in four Australian states — Victoria, South Australia, Tasmania and Western Australia — under their Certified Garden Centres program.

The staff at these centres are SGA-trained and the nurseries are independently audited to receive their certification. They use less water and energy, avoid chemicals and don't sell invasive plants. They're great for advice on all the latest sustainable gardening practices because they're constantly on the lookout for

sustainable products and services. These people are passionate about the environment.

Sounds like my kind of nursery. To find one in your state, have a look at their website, www.sgaonline.org.au. If you have one nearby, check them out now.

Your local nursery or garden centre: Most employees of nurseries and garden centres have good local knowledge, as well as being able to direct you on commercial garden products and plant selection. Be sure to ask them the right questions, though, such as what plants are actually indigenous to your area, not just the country.

Deciding What You Want Your Garden to Be

Before you start designing your sustainable garden, you need to make a list of all the things you want. Be as extravagant as you like. Get the whole family together and have a brainstorming session around the dining table. Start with your dream garden, no holds barred, no budget. Think about how you want to build sustainability into your design — Chapter 5 helps you focus on these areas specifically, but start thinking about things like the best spot for a compost heap or bin (check out Chapter 9 for information on composting) and the sort of watering system you want (refer to Chapter 3).

Here are some ideas for features you might want or need in your sustainable garden to get you started:

- Shed
- Greenhouse
- Trampoline, swings, sandpit area for the kids
- Vegie garden
- Orchard
- Pond
- Rainwater tank
- Swimming pool
- Chook yard

Compost heap

Worm farm

Shady trees for the summer

Lawn, to throw a ball around

A garden for cut flowers

An insectary to attract good bugs to your garden

Somewhere to put the banana lounge or to swing a hammock

An outdoor spa

A pergola to grow a grapevine over

A paved outdoor entertaining area with room for furniture and the barbie

A dog or cat run

Gardens are very much an extension of your living space and should be treated as an asset to your home. Whether you have a large country garden or a small courtyard, creating a functional, attractive living space that incorporates your needs, lifestyle, taste and budget is important. Most importantly, though, it must be sustainable.

When you've done your site analysis and made your extravagant wish list, you need to work out what you want your garden to be. Yes, of course you want it to be sustainable, but what is your garden actually for? The best way to answer this one is to think about a few things:

- **What sort of life do you lead?** Maybe you work full time, and spend your weekends and evenings ferrying various kids to various sporting or other commitments, usually at opposite ends of town at the same time! Be realistic about how much time you have to spend in your sustainable garden. It's all very well to want a big garden full of vegies, herbs, flowers and fruit, but it'll soon look wild and overgrown if you haven't the time to maintain it.

- **Do you like to entertain family and friends at home?** If you like to have leisurely backyard barbies with your family and mates you'll need space for that.

- **Are you someone who even likes to garden?** I can't believe how many times I've been called in to design a garden for a client who actually doesn't like to garden at all. They just want what the neighbour has! If that's the case and you want a garden but don't want to actually garden, you need to make sure you can afford a

good sustainable gardener to maintain it for you.

- **Who lives at your place?** That may sound like a silly question, but it's a really important one. If you have kids, how old are they? If the space allows, little kids need room to run around, play in a sandpit or maybe have swings and slides. A water feature with a reflecting pool might be beautiful, but water and kids can be a dangerous combination. If you do want a water feature, make sure there's no pond or pool, especially when the kids are little. I've seen some great kid-friendly water features where the greatest danger is wet kids!

- **Do you, or someone else at your place, use a wheelchair, or have trouble getting around easily?** If that's the case, you need to keep your pathways clear and manageable. Also be aware if someone at your place has allergies or asthma that can be triggered by certain plants or insects (see Chapter 5 for more on gardens that look after you).

- **How much do you want to spend on your garden?** Does it always have to come down to money? I'm afraid so! Be realistic about your budget. If you're building a new garden or modifying and redesigning an old one, ways to avoid breaking the bank can be found. Be resourceful. How much of the old garden can you recycle? Keep on the lookout for recycled garden materials. I know someone who got a load of pavers for free from people who were redoing their garden and were going to throw them out. Sometimes you can even get plants for free from other people's gardens, though you might just have to dig them out yourself. Check the local paper for giveaways.

Okay, now you've worked out what sort of site you have at your place and checked out the neighbourhood. You've made a wish list and then probably had to prune it back a bit to be more realistic, thinking about what you, your family and the life you lead dictates for your garden choices. It's now time to start really planning your sustainable garden.

Chapter 5 helps you continue your journey in designing the sustainable garden that's right for you.

Chapter 5

Creating a Garden Plan

In This Chapter

- Understanding sustainable gardening principles
- Looking at different garden styles
- Using a site map to plan your garden
- Choosing the right plants

Good planning is the key to almost anything. From day-to-day work to finances, people plan for things to work out the way they want them to. Well, gardens are no different.

In this chapter, you get to know the principles of good sustainable garden design. And, even though you may already have a favourite style of garden, you get a glimpse at a number of styles and how you can adapt them, if necessary, to become a sustainable garden at your place. Sometimes what looks fabulous and what is practical in the garden are almost mutually exclusive. I help you to work out the ins and outs of practicality versus appearance in your sustainable garden.

I also give you some handy hints and tips on choosing the right plants for your sustainable garden, and dip into the native versus exotic debate as well.

Understanding the Principles of Sustainable Design

Sustainable garden design applies to every type of garden style. In any garden, big or small, sustainable gardeners think about the environmental impacts of every part of the garden and every activity in the garden. Sustainable gardeners are long-sighted folk who think not only about the short-term environmental impacts of their gardens

but how their gardens affect the environment in the long term. When you're designing your sustainable garden, think about the idea of stewardship rather than ownership of the landscape. Aim to create a garden that will enhance rather than damage the environment.

As with just about anything, however, you need to understand some basic garden design principles before you get started. Well-designed gardens don't usually happen by accident, although I have seen some beautiful gardens that have evolved rather than been planned. Mostly, gardens need thought and planning to get them right. Think of gardening and garden design as an art guided by some basic methods and principles.

Here are some basic principles of garden design:

- **Simplicity:** Yes, you need to follow the KISS principle. You know the one, 'Keep it simple, stupid'. The best way to achieve simplicity is by repeating colours and shapes, and types of plants, paths, walls and other features. Have a look at any natural plant community and what you'll see is repetition, with green typically being the most dominant colour in any simple garden.

- **Symmetric and asymmetric balance:** If you cut a balanced garden in half, you find that both sides are interesting, even though the two sides don't necessarily mirror one another. Symmetrically balanced gardens are generally formal gardens where each side is the same. Asymmetric gardens have the same level of interest on either side; they're just not identical.

- **Proportion of scale:** The size of things in your garden in relation to each other and their surroundings is what's important. For example, putting huge features such as trees in front of a small cottage will make the house look even smaller. The same goes for paths; a narrow cobbled path leading up to a grand mansion will look odd indeed.

- **Focus:** When you look at a scene, no matter what it is, your eye is always drawn to one feature, then slowly takes in the rest of the scene. The thing you look at first is called the *focal point*. Often a focal point in a garden is a statue or specimen plant, but it can be a tree or shrub that puts on a brilliant display of flowers in the summer. So the focal point can change in your garden from season to season. Even at night, you can change the focal point by spotlighting an interesting tree, for example. Watch out you don't try too hard and whack in as many focal points as you can. Do that and your garden will just be busy and you won't know where to look first. Sometimes, in a small front garden, for

example, the easiest focal point to create is a path to the front door.

- **Line and rhythm:** Aim to create a sense of movement for your eye. You can do this by linking garden beds with lawn or groundcover plants to help create a sense of continuity and flow through your garden. If you have a large garden, gently rolling lines and bringing outside features and views in can help to create a sense of easy movement. You can do this by using plants in your garden to either frame a view or draw your eye to it.

Tie all of these things together and you'll create a magnificent sense of unity in your garden. The garden will look as though it's always been there.

Pay particular attention to the house that the garden surrounds and tie the style of garden, colours of plants or other landscaping materials you use to the style of your home. You'll end up with a house that sits in and works in harmony with the garden, rather than two separate and mismatched things sitting side by side.

When you've got the hang of those basic principles, you need to work in the principles of sustainable design.

Designing a sustainable garden is just a matter of thinking outside the square and adapting sustainable principles to the garden style you want to create at your place. You may need to change a plant species here and there, or think harder about where you get your landscaping materials from, but hey, that's why you're reading this book in the first place. You're already someone who thinks outside the square and wants to make a difference through gardening sustainably. Good on you! Sustainable garden design is all about designing a garden that reduces your ecological footprint.

When you're planning your garden, think about how to apply these principles of sustainable garden design:

- **Reduce your footprint.** Think about the carbon and ecological footprint your garden might have and aim to reduce it as much as you can. Think about the bigger picture, how your garden will

affect your neighbours, the local bush, the waterways and the rest of the planet now and in the future. Think about not just your plants and lawns, but the other features that make up your garden. Use a solar pump if you have a pond. Use solar lights to light your way, rather than relying on electric lights.

- **Protect your soil.** If you have to alter your soil or ground levels, think about working with the existing lay of the land if you can. Aim to create minimal disturbance or changes of levels. Stockpile and reuse the soil on your site rather than bringing new stuff in. Improve your soil, don't replace it. Add organic matter and manure to do this (see Chapter 9 for more on compost and mulch, and refer to Chapter 2 for all the details on soil).

- **Choose the right plants.** Use plants suited to your soil type and climate rather than trying to change things to suit the plants you want. Chapter 11 gives you lots of tips on selecting sustainable plants.

- **Go for *biodiversity*.** A well-maintained sustainable garden is teeming with all types of diverse species, from the smallest microscopic critter to the tallest tree. Plan to include as many different types of plants as you can. A *monoculture*, a large area planted with a single species, isn't only unnatural, it can create all sorts of headaches when the bugs move in (see Chapter 16). Create an environment for the good bugs by planting lots of different plants and the bad guys will be kept under control. By creating biodiversity, you'll also be less reliant on chemical sprays to control pests, diseases and even weeds. See Chapter 7 for more on biodiversity.

- **Live off the sky.** A well-designed sustainable garden has plants chosen not only for their suitability to your soil, but also for their ability to live off the natural rainfall. This may not be the case with your vegie garden, so mulch the soil and recycle or harvest as much water as you can and apply it to the garden by subsurface irrigation rather than sprinklers that spray a fine mist of water above the ground. Sprinklers like this are much less efficient, with water blowing away, evaporating and not getting to the roots where the plants need it. Only water the garden when it really needs it. Remember, a good long infrequent drink is much better for your plants than a little sip of water every day. If you want to plumb your place to use greywater or invest in a water tank, refer to Chapter 3 to help you decide on the right system.

- **Be a weed warrior.** Make sure no plants in your garden are likely to jump the fence and end up adding to our already enormous

weed problems. If you already have some of the nasties at your place, either get rid of them and replace them with something more friendly or learn when and why they spread, and ways to manage them so they don't get away. A simple thing like *deadheading* (removing all the dead flowers before they go to seed) can stop them in their tracks. See Chapter 19 for some interesting facts about weeds on both sides of the Tasman.

- **Don't create an energy crisis.** When you design your garden, pretend big smelly petrol mowers, whipper snippers and all of those other power-driven tools don't exist. Or, if you must have lawn, make it a smaller manageable lawn that doesn't need hours of running up and down with the petrol mower. Better still, investigate the best low-maintenance native grasses for your lawn. You can find information on sustainable lawns in Chapter 13.

- **Don't wreck another environment.** Just because you want a beautiful garden at your place doesn't mean someone else's environment or ecosystem needs to be wrecked. Think about where the materials you use to build your garden come from. River or beach pebbles are popular these days, but where do you think they come from? Chapter 6 gives you the lowdown on sourcing landscaping materials for your sustainable garden.

Talking about Garden Styles

The style of garden you want at your place really is up to you. A garden is an individual thing, just like the way you decorate the inside of your home is really a matter of your personal taste. Your home reflects your individuality and the way you like to live. So should your garden.

You can even use vertical gardens (see Chapter 14) to create separate garden rooms or to section off parts of the garden. Hedging and screening are also fabulous ways to hide an unsightly view of the neighbour's clothesline or that part of the garden that contains the compost or bins.

You need to think about a couple of things when you're deciding on a style for your sustainable garden:

- Does the style you like suit the style or era of your house?

- Is it a style of garden that needs lots of maintenance to keep it looking great? That's fine if you're a gardener and have the time to maintain it, but, if you're not and you don't, it can look pretty rough.

In the following sections I look at some of the more popular styles of gardens.

Cottage gardens

This style of garden is informal, with low picket or wire fences, or perhaps even a low wall. Usually it's a small, cosy sort of a garden with informal plantings of colourful flowers, groundcovers and small trees.

A cottage garden can combine fruit, flowers, herbs, shrubs and trees that all complement each other, with no one plant or feature dominating. Some great cottage gardens use a mix of both native and exotic plants to great effect. These are great gardens for biodiversity and attracting the good bugs to your place.

Just don't build a cottage garden in front of a sleek, geometric modern building. I've seen that done and, although it may appeal to your taste, it looks a bit strange. The style of garden really does need to match the house.

Native or indigenous gardens

For this style of garden you can use any plants you like, as long as they're native and/or indigenous to your area (*indigenous* plants are those that originate in your specific area, whereas *native* plants are in a broader category and can be said to be native to perhaps the whole country). Generally, most people think of native gardens as informal gardens that might even replicate the local native bush. That is often the case, although, by choosing the right plants for the job, you can create a quite formal garden using native plants if that is to your taste.

The benefit of using native plants or, better still, indigenous plants in your sustainable garden is that native plants attract and support native wildlife. Just remember to include a range of different sorts of plants so that you not only provide food for the native critters, but also shelter, water and a place to breed. Choose plants to provide

nectar, seed and building material for nests.

Sometimes people think that a native garden is a low-maintenance garden. This is not the case. Native plants need attending to during the year as well. Maybe they don't have a high fertilising requirement, but they do need pruning or trimming so they're kept under control and looking their best.

Romantic gardens

A romantic garden is a garden filled with flowers to cut and arrange in your house. Traditionally, the flowers are roses, but, because they have a relatively short flowering season, you could fill your romantic garden with a range of plants that provide beautiful flowers year round. Some great Australian native plants such as *Chamelaucium uncinatum* (Geraldton wax) and *Philotheca myoporoides* (long leaf wax flower) are well suited to this purpose.

Try plants with delicate perfume and create a secluded area where you can put a seat or swing a hammock made for two. For quiet romantic evenings outside, consider muted lighting under feature trees or shrubs. Also consider plants with grey foliage and white flowers. White flowers and silvery grey foliage have a special romantic look all of their own under moonlight! Include also those very special species of plants that only exude their perfume after dark. Some easy-to-grow species are *Cosmos atrosanguineus* (chocolate cosmos) and the climber *Trachelospermum jasminoides* (star jasmine). The star jasmine is a better choice than the common jasmine, which has perfume that can be a bit overpowering and is also a weed in some areas of Australia.

Formal gardens

Clipped hedges are what usually spring to mind when I think about formal gardens. English box hedges are planted in symmetry and clipped so precisely they almost don't look real. Formal gardens are a display of people's power over nature, the ability to control a plant to make it do exactly as required, with not a leaf out of place. Early French gardens are a good example of this manipulation and control over nature; they were often large geometric gardens with lakes and

fountains.

A formal garden doesn't have to be all clipped and geometric hedging; you can create a formal look using symmetrical mass planting and layering. Instead of clipped hedges or topiary, you can use symmetrical planting of interesting structural plants or textural grasses to give the required uniformity of a formal garden.

If clipped hedges are your thing, some great native plants such as *Westringia fruticosa* (coastal rosemary) or some of the smaller *Metrosideros* species (pohutakawa) in both Australia and New Zealand are up to the job. Just ask at your local nursery or native plant society for those suitable for your area.

Renaissance gardens

Renaissance gardens were originally gardens that showed off the wealth and prestige of their fifteenth- and sixteenth-century owners. They were representations of the cosmic order and balance of the universe, and laboratories for horticultural science, laid out according to precise mathematical principles. They incorporated sculptures, plants and water to great effect. To create this at your place, use ornate sculptures or a fountain surrounded by neat, clipped plants and sweeping lawns.

Around the Mediterranean

Think Mediterranean and you probably think relaxing, sun-drenched gardens with brightly coloured pots and hanging baskets filled with geraniums, succulents and lavender. Often these gardens are built on rocky slopes with poor soils and little water; in fact, they seem to be gardens that thrive on neglect. Sounds sustainable to me.

I've seen a beautiful Mediterranean-style garden with cabbage trees and olive trees as the feature plants. Remember, it's not the *actual* Mediterranean plants you need, it's the look. Find plants that create the look at your place, and then sit back with some good wine and cheese and enjoy.

Mediterranean countries have developed their own styles of garden also. Not all regions of these countries are on the coast!

Greek gardens

These people had the right idea; they decided gardens could be more than just places for growing food. They could become places for relaxation and entertainment. Typically, gardens of Greek style are surrounded by walls or hedges with statues of gods as a focal point.

The blue and white of the Greek flag is often used extensively in these gardens, for paths, pots, even flowers. Olive trees and grapevines are often used both as plants and as decoration in the patterns of pots and tiles.

Italian gardens

When I think of Italian-style gardens I think of symmetry — the use of plants, sculpture and columns, with each side of the garden exactly the same. Focal points can be fountains or statues, and well-tended garden beds with olive and cypress trees are used to great effect.

Spanish gardens

A Spanish-style garden is a garden for lazy outdoor summer entertaining under lush shady trees or a covered terrace. Brightly coloured, patterned tiles, comfortable seating and plants with bright bold colours can give a Spanish feel to your garden.

Woodland gardens

A woodland garden is designed to look quite accidental. Under a canopy of deciduous trees, small understorey plants for both sun and shade are randomly planted in groups to look just like a natural woodland forest. Paths are usually subtle and meander through the garden. Sometimes water is added in the form of a pond or small lake, or a creek snaking through the trees.

The idea is to place everything as if it were natural and to replicate nature as much as possible. If you have no water, you can create the effect of a creek or stream by using sand, rocks or pebbles, and plants placed exactly as they would be if there was water. Before you do, though, check out Chapter 6 for information on sustainable landscaping supplies, including sand and rocks.

Arid gardens

Not to be confused with water-wise gardens, although they are of

course water-wise, arid gardens are designed to live and thrive in arid climates and suit many of Australia's driest regions (you wouldn't want to try one in New Zealand though!). These gardens use plants suited to rather hostile desert-like environments. The plants that grow best in these gardens have developed quite clever adaptations like spines or thick fleshy leaves — in fact, all sorts of things — to make them able to collect enough water to survive and to protect them from likely desert predators.

It makes sense really, if you live in an arid area, to plant an appropriate garden that doesn't consume precious water or require fertilisers that the native plants in the area hate.

You can use desert sand, local rocks, spinifex and local desert plants to great effect. Depending on where you are, these plants could include *Hibbertia hypericoides* (native buttercup), *Swainsona formosa* (Sturt's desert pea) or *Spinifex* species (spinifex grass). Not only should these gardens live off whatever moisture is around, be that rainfall or even morning dew, by using local species you help to preserve these interesting desert plants.

Rain gardens

If you're building a new home, consider incorporating a rain garden into the design (they're easier and cheaper to install at the building stage rather than retrospectively). This terrific concept directs water from your roof and hard surfaces, such as paving, that would usually head off down the stormwater drains into specially constructed gardens. The water is slowly filtered through the garden, so that what is not used by the plants is filtered through gravel and soil to help remove any pollutants. What does eventually find its way into the stormwater is cleaner and less toxic.

You have to be careful with your plant selection here. You need perennial plants that can tolerate long dry spells and short bursts of inundation, and that also have deep, fibrous root systems. Many native plants are suitable for this style of garden, but which ones you use depends on where you live.

Melbourne Water has a great website at www.wsud.melbournewater.com.au that includes heaps of tips on water-sensitive urban design. Click on Fact Sheets to download

information on rain gardens. In New Zealand, go to www.sustainability.govt.nz, click on Water and select the subtopic In the Garden. Scroll down to Rain Gardens and click on the heading for more information.

Gardens that look after you

Some gardens are grown to suit the specific needs of the people who live or visit there, such as older people and those with asthma or allergies. Everyone has the right to enjoy a garden!

Asthma- and allergy-friendly gardens

According to the World Health Organization, more than 150 million people on the planet have chronic asthma and more than 5 million people just in Australia suffer from seasonal hayfever. It's a wonder anyone can get out in the garden at all.

An asthma- and allergy-friendly garden is not a garden designed to make you sneeze and wheeze, but a garden designed to have minimal allergens so those who are allergic to certain plants and flowers can enjoy the touch and smell of safe plants. To create one of these gardens you need to do a bit of homework and choose plants pollinated by bees and insects rather than wind, such as *Correa alba* (white correa) and *Metrosideros* species (pohutakawa). The fine, wind-borne stuff is what gets up your nose and into your lungs.

You also need to think about what sort of mulch to use. You can get some good information from the Asthma and Respiratory Foundation of New Zealand or, in Australia, the Asthma Council in your state or territory.

Age-friendly gardens

This style of garden is designed to suit the needs of older people, and can be adapted for those with a disability, but read on to check out 'Sensory gardens' for more suggestions. Gardening has health benefits for both young and old but, as people age, they can have a harder time managing and maintaining a garden. Age-friendly gardens are gardens designed or modified to suit an older person's abilities.

In this style of garden, incorporate things like raised beds (Chapter 12 gives instructions for constructing all sorts of garden beds), vertical gardens (see Chapter 14) and solid, non-slip paths. Gardens can be dangerous places, so understanding how to design and build a garden for anyone, regardless of age and ability, helps to ensure getting out in the garden for years to come.

Designing and building an age-friendly garden on sustainable principles makes good sense as it needs less maintenance.

English gardens

The traditional English landscape is one you may very well be familiar with, even if you've never been to England! The early British settlers to the shores of Australia and New Zealand brought with them their idea of what a traditional garden should be. They also brought along a few plants and animals you'd probably rather they'd left behind.

Originally, English landscapes were vast lawns and big leafy trees such as *Quercus robur* (English oak) or *Liquidambar styraciflua* (liquidambar) surrounding large country homes, with small gardens here and there near the house. They also had kitchen gardens and orchards. In later years, this style pinched some ideas from the French and Italians and started using sculptures and long lawn vistas.

Modern American gardens

This style emerged in the middle of the twentieth century, characterised by asymmetrical forms, curves, functional spaces and modern materials. The plants are usually native to the area and the gardens designed to flow from the house, making an indoor–outdoor area.

Contemporary gardens today borrow much from this style, designed as an extension to the home for both passive and active recreation and entertaining.

Altered states and senses

Some gardens are actually designed to stimulate the senses and help to create a state of enlightenment.

Sensory gardens

This style of garden is designed to stimulate the five senses of smell, touch, taste, hearing and sight. Plants are chosen for their therapeutic potential and to provide a stimulus for enjoyment. These gardens use plants with varied scents and interesting textural differences. They also provide seasonal interest and display brightly coloured flowers, fruits and foliage.

A well-designed sensory garden gives immense visual pleasure and is relaxing and peaceful. A sensory garden is a garden for all people to enjoy, regardless of age, impairment or mobility. Garden beds are constructed to make the plants accessible to people in wheelchairs; paths are constructed so those who are not so sure-footed can move around easily.

A wonderful garden, accessible to people of all ages and abilities and designed simply to delight and stimulate the senses. Now that's what gardening is all about!

The paradise garden

Like the sensory garden, the paradise garden is a garden to stimulate all five senses of smell, sight, hearing, touch and taste. These gardens, based on Islamic culture, are laid out in geometric patterns and are designed with flowing water, lots of colour, edible plants and wonderful, textural soft and hard landscaping materials as a space to relax and shelter from the hot sun.

Zen gardens

This style of garden is designed as a place to find peace and enlightenment through quiet meditation. Using carefully placed rocks, sand, shrubs and water, you can create an outdoor space for contemplation at your place.

Oriental gardens

Various styles of Oriental garden exist. Here are two that are distinctly different.

The Japanese gardens

This style of garden seems at first glance informal and a bit

haphazard, but look closer and you can see that the arrangement of plants, rocks, water and other features has a purpose. Everything is meticulously placed in the garden to incorporate constantly changing views as you move through it.

These gardens are filled with symbolism and meaning, and come in many different forms, but most use rocks, stones, bridges, water, waterfalls, trees and plants such as low-growing conifers and delicate *Acer japonicum* (Japanese maple). These gardens are not a riot of colourful flowers and shrubs; rather the plants are used in a subtle, more structural way, with perhaps a grafted Japanese maple beside an interestingly shaped rock to depict forests and mountains.

You often find koi, or carp, in the ponds of these gardens. Be aware that these fish are considered pests that have decimated populations of native fish species since being introduced to Australia and New Zealand. If you do use these exotic fish, don't ever release them into waterways or flush them down the loo!

The Chinese scholar

This traditional garden style dates back to the seventh-century Tang Dynasty in China. The garden was seen as a place of meditation, relaxation, a place to cultivate the spirit. The idea is to create the cosmos, incorporating mountains, hills, rivers, lakes, cliffs and chasms, in miniature of course.

This garden is not meant to have flowers; it's all about the contrast of light and shade, sounds and scents, heights and depths, and yin and yang. Foliage plants are used to great effect in a Chinese scholar garden. Mass plantings of *Liriope muscari* (liriope) or *Bambusa multiplex* (hedge bamboo) are ideal.

Practicality versus appearance

No matter what style you choose, practically any style of garden can be a sustainable garden. It's all about understanding the site and choosing the plants that will do the job you want them to do. For example, if you want a small weeping Japanese maple for your Japanese-style garden, and you live in an area that cops hot winds in the summer, your poor old Japanese maple will fry.

So, the idea is to forget about the traditional plant species associated with the particular garden styles, and find plant species that will give you the look you're after and be able to thrive in the conditions at your place.

A clipped formal garden may be your idea of the perfect garden, but how practical is it? How much work are you able to put into maintaining it? A poorly maintained formal garden can look very sad and tired indeed!

Getting carried away when planning your sustainable garden is easy to do, and you can end up with all sorts of weird and wonderful things. Stop for a minute and be realistic about how much time and energy you can put into maintaining your new sustainable garden.

Drawing Up Your Design Plan

After you've had a good look at your site, bearing in mind the design principles for a sustainable garden, and have an understanding of garden styles and what you want at your place, it's time to draw up your plan.

You can approach this task in a few different ways. You can bring in a professional, or you can draw up the plan yourself, either by hand or using a computer program.

Going for professional help

Engaging the services of a professional sustainable garden designer may not be as expensive as you think. In fact, if drawing isn't one of your strengths, engaging a professional may save you money in the long run. Just make sure the person you employ understands your vision for your sustainable garden.

A real benefit to hiring a professional is that a professional will bring fresh eyes and a fresh approach to your project, and may suggest some features you haven't thought of.

Engaging the right designer for you can involve a bit of work on your part; finding the right one isn't simply picking the person with the nicest looking advertisement in the Yellow Pages. Ask around; recommendations from family or friends are invaluable in finding the right designer.

Meeting with more than one designer before you make your choice is a good idea. After all, it's your garden and you have to be comfortable that you and the designer are thinking along the same lines. Ask to see examples of their work, and ask for their qualifications and 'sustainable credentials'.

Doing it yourself

You don't have to be a great artist to produce a great garden design. You just need to be able to produce something you and maybe your landscaper can follow. If your plan is fairly simple and straightforward, it doesn't really even need to be to scale. But if you want to design your garden to scale, I give you some steps to follow later in this section.

You can draw up your plan on a computer. A stack of garden design programs are available for you to choose from, ranging from under a hundred dollars to several thousand dollars. Some are easier to use and more useful than others. Doing so also depends on your abilities with a computer!

Do a search on the web to see what software's around. One good inexpensive software package is 3D Home Architect Home & Landscape from www.mindscape.com.au. A fully professional program, which is rather more expensive but very popular, is LANDWorksCAD from www.landworkscad.com.

If you have decided to have a go at drawing up your own garden design, whether you're drawing by hand or on your computer, you need to do a few things to get started.

If you have a large space, decide whether you're designing your entire garden or just bits at a time. Sometimes a big garden can be a little overwhelming and biting off small chunks is best to keep it manageable. Just make sure you keep in mind your ultimate vision for the whole of your sustainable garden.

Measuring your space

Whatever size space you're designing for, you first need to measure it and remember to include everything that's currently there, even the

things you want to get rid of. This bit is even easier if you have a plan of your property from the architect or builder, which should include the outer dimensions of the property and the space taken up by your house and any other buildings. You still need to measure other bits you may have added since your place was built, though, such as gardens you've already put in.

Start by drawing a *mudmap*, which is basically an aerial sketch of your site that isn't drawn to scale (Figure 5-1 shows an example). You can jot down your measurements on the mudmap against each part of the yard you're measuring. Remember to include everything on your property, especially all of the services, such as gas, electricity and water, and any underground pipes you're aware of.

For the actual measuring, you need some equipment:

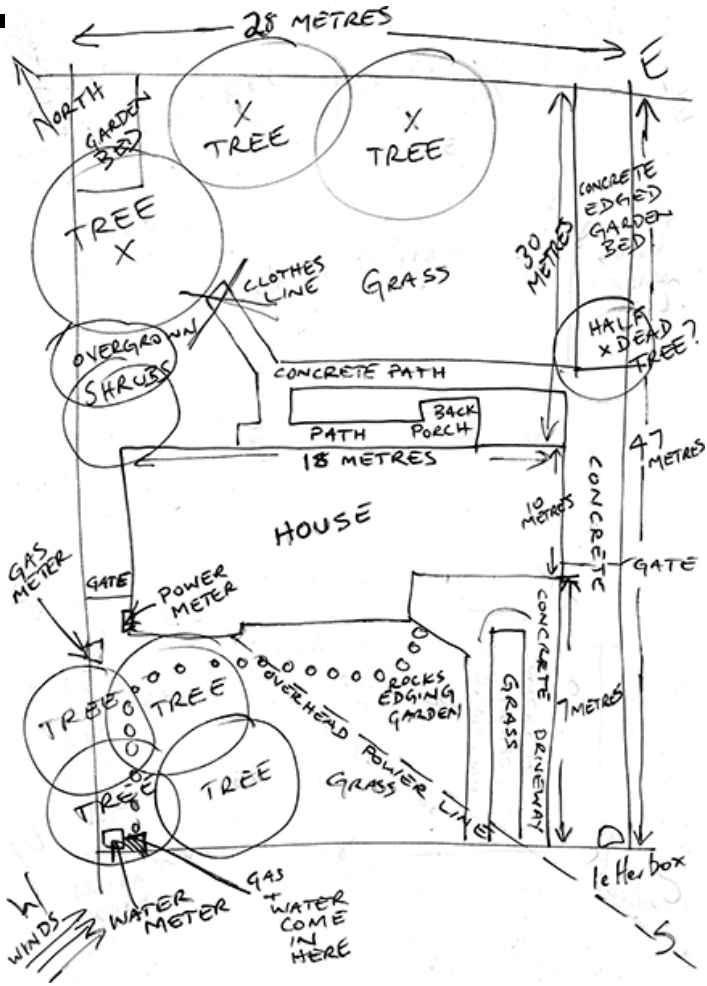
- **A tape measure:** The longer the better, if you have a big yard.
- **A pencil and your mudmap to note down your measurements:** Don't try to commit your measurements to memory, especially if you have a few twists and turns around the yard.
- **A helper:** Kids are really good for this purpose. Nothing is more frustrating than trying to hook up a tape measure and read it yourself when it keeps unhooking.

Drawing your site map to scale

When you have your measurements, you need to transfer this information to a large piece of paper — graph paper is ideal. Most garden designs are drawn on A1-size paper, which is 841 by 594 millimetres, or A2, which is 594 by 420 millimetres. The size of the paper will really depend on the size of your space, even when drawing to scale.

A simple scale used in many garden designs is 1:100. That means 1 centimetre on the page equals 1 metre on the ground. This is a good scale to get you started. So, get yourself a piece of A1 or A2 paper, a sharp 2B pencil (they're softer than HB and won't leave indentations if you have to rub out a lot), a sharpener, an eraser and a ruler.

Figure 5-1: A mudmap allows you to roughly draw in everything in your existing yard so you can jot down your measurements as you go.



If you want, you can buy a scale ruler to make the job easier. A good scale ruler to use will have a combination of scales that include 1:1, 1:10, 1:20, 1:50, 1:100 and 1:200. You can buy these at stationery or art supply stores. While you're out shopping, it may be an idea to pick up a circle template. This is a flat rectangle of plastic with circles of various diameter cut out of it. You can also buy yourself a couple of fine, black drawing pens — 0.1-millimetre to 0.5-millimetre tips will do the job. Or, if you're like me and can't help yourself, buy two in every size available.

To start drawing, you need a nice clean flat surface — the dining table will do. The family can just eat somewhere else for a while! Now have a go at converting your measurements to scale on your piece of

paper. Remember to include everything in your yard.

Dropping in your ideas

When you've drawn up the site map, think about what needs to go and what really must stay. Think about the shapes and heights of plants you might like. After a few goes you should come up with something that pleases you. Remember, the style of your sustainable garden should suit the style of your home, particularly the bit that's on view for all to see.

At this stage you also need to be aware of shade, sun, wind direction and so on, because these things have an impact on the sorts of plants that can be put in different locations in your garden.

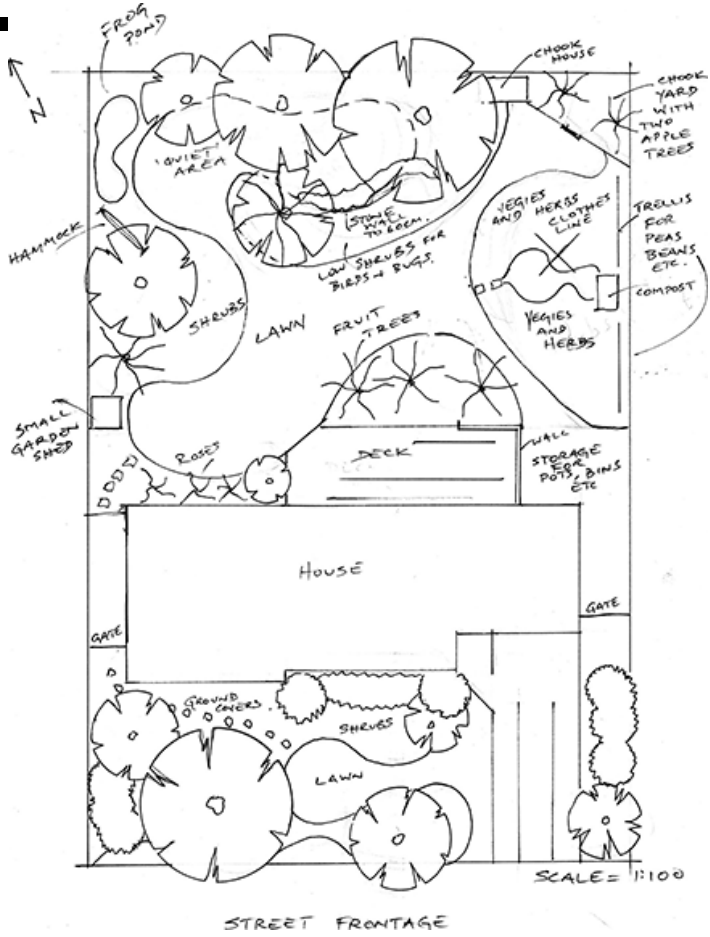
You're trying to create a space that is both aesthetically pleasing and functional for you and whoever shares it with you. You may want a tall deciduous tree in the corner to provide shade in summer and let much-needed winter light in. Say you want a tree that will grow to about 10 metres tall and 6 metres wide. Grab your circle template and draw it in.

Finalising your plan

Remember, your plan is about working out what you want your garden to be, whether it be formal, cottage or any one of the other styles. Specific plant choices can be left until later. You may even be able to draw up your design without naming the plants and then seek professional advice. I've had many a client who has drawn up a very good design, but needs help to work out the appropriate plant selection. Often you know exactly what you're after; you just have no idea if it's the right plant for your place or even what on Earth that plant is called.

Your final drawing may look something like the one shown in Figure 5-2. Compare this drawing with the mudmap shown in Figure 5-1.

Figure 5-2: Your final plan, drawn to scale, may include a frog pond for a 'quiet' area, fruit trees and a vegie patch, and you can still include some lawn.



Picking the Right Plants for the Right Spot

You can design and build any sort of garden on any sort of site. It may look fabulous for the first year, month or week, or it may be the perfect garden and suit your needs, and those of the plants you select, for years to come. The trick is to understand your site and plant the species appropriate to that site. If the plant you want isn't right for the site, find a plant that does the same job, and fits your site.

Before you decide on the plants for your garden, work out the job the plants need to do. For example, if you want a clipped formal garden but really love native plants and have very little water, find the native plants that tolerate those conditions and that treatment. It's all about using the plant species that suit your place.

Native versus exotic

Tricky question, this one. Some people will not, under any circumstances, ever plant native plants in their garden. During a trend towards planting native gardens in Australia in the 1970s, many people thought you just needed to bung 'em in the ground and that was that. No water, no maintenance. They ended up with gardens that looked scrappy, often with huge trees and overgrown shrubs that were most inappropriate for the small suburban blocks they were planted in. As a result, the no-native school of thought emerged.

Native plants can be an asset to any garden and can be used in any garden style; it's simply a matter of deciding what you want the garden to be and finding the right plants for the job.

Other people hate exotic or introduced plant species. If it's not native to the country or even indigenous to the particular region, it's not welcome in the garden. These people can be heard claiming loudly that all other plant species don't belong, shouldn't have ever been planted and, by definition, are all weeds so, therefore, we should get rid of them all.

Perhaps more moderate sustainable gardeners, like you and I, sit somewhere in the middle of all of that. The moderates choose plants for their garden that suit the purpose they want them for and take into account their ability to thrive in the conditions at their place. They make sure they're not potential escapees that will later turn into the next Weed of National Significance that will take millions of dollars to eradicate from bushland, roadsides and pastures.

Perhaps a bit of both

The way to create a happy medium in your sustainable garden is to plant a mixture of both native and exotic plants. Look at the natives and exotics that grow well in your area but don't turn nasty and decide to move out of your yard to begin a slow march across the country with the cane toads or the possums, depending on which

side of the ditch you live. These are the plants you need to consider for your spot.

Chapter 6

Making a Statement

In This Chapter

- Learning about sustainable landscaping
- Looking at sustainable garden features
- Bringing in the professionals

Talking about sustainable gardening in terms of plants and other living things is all very well, but an important feature of your sustainable garden is the way you landscape, including the materials you use.

In this chapter, I talk about how sustainable gardening principles easily apply to landscaping. You learn the difference between soft and hard landscaping, how to keep water on your site and how to select the best sustainable and environmentally friendly materials for your sustainable landscaping job.

Where do those great and sometimes very cheap garden pots and other fabulous garden features you see in the nurseries, garden centres and specialty shops come from? I give you the lowdown on where they're sourced, how they're manufactured and the carbon footprint they may just be generating getting from there to your place.

You might be surprised where some of your landscaping materials and other garden features come from.

Sustainable Landscaping

A sustainable landscape is one that you can keep and improve on indefinitely, and that has minimal impact on the environment; in fact, it's a landscape that enhances or preserves the environment. All landscapes should have a positive effect on the environment they're built in. Your landscape should provide aesthetic, practical and

environmental benefits to your home. Your garden should be designed to look good and to also take into account the impact it may have, not just on the immediate environment, but on the planet.

Ideally, your sustainable landscape maintains itself, surviving and thriving because it's designed and built to suit the natural cycles of your local environment — not built to a fashion or a trend made popular by magazines or television shows. Remember, not all garden styles or groups of plants will suit your place.

Here are a few characteristics of sustainable landscapes:

- Sustainable landscapes include plant species appropriate to the ecosystems at your place, and not just natives, but exotics, fruit, vegies and herbs (see Chapter 12 for more on growing a food garden).
- They incorporate systems to capture rainwater or use greywater, and they use irrigation methods that assist in controlling soil salinity (refer to Chapter 3).
- Roof and wall gardens are used where there isn't enough land, which is great in urban areas, where buildings leave very little productive space on your block. Check out Chapter 14 for all the goods on gardening for small spaces.
- They help reduce greenhouse gas emissions, by using renewable materials sourced close to home, as well as by storing carbon in the plants they use.
- The materials they use protect and nurture the soil (refer to Chapter 2).
- Sustainable landscapes are kind to the planet and reduce your environmental footprint.

Thinking about sustainable materials

Soft landscaping, hard landscaping, what's the difference? Well, the soft stuff is the plants, mulch, soil and the like, and the hard stuff is what is commonly called the built part of the landscape. You know the things — retaining walls, pavers, posts, decking material, rocks.

Choosing sustainable landscaping products is easy when you know what to look for. When choosing landscaping materials, find out where they come from and think about the environmental impact of the manufacture, harvest or transportation of those materials.

River pebbles come from rivers right? Which rivers? Think about the environmental impact of taking pebbles out of a river's ecosystem. What happens to the river, the fish, the plants, the quality of the water? Check out the section 'Pebbles, rocks, sand and stones' later in this chapter for some of the effects of these types of practices.

Landscaping projects can have a huge impact on both the immediate and surrounding environments. Creating huge areas of hard paving surfaces can cause problems with water running off your site during heavy rain, causing erosion elsewhere. By not creating huge impervious surfaces, you can ensure water moves through the area slowly and as much water as possible stays on the property. The idea with water runoff is that you want it to slowly soak into the soil to help maintain a good soil moisture level.

The problem with many urban areas is the sheer number of massive stretches of hard surfaces. After a significant rain event, the water runs off the surface so quickly stormwater systems can't cope with the rapid inundation and flooding can result.

When you're considering how to environmentally manage your landscape site, you need to think about a couple of things:

- How is what you're planning going to impact on not only your place but the environment beyond your fence?
- Where do the materials you're going to use come from? The further they have to travel, the more transport used, the more greenhouse gas emissions are produced. Local products make sense.
- What's the likely lifespan of the materials and are they suited to the conditions at your place? Salt-laden sea winds, for example, can make your timber or wrought-iron furniture look unattractive quite quickly, and even make it rot or rust.

Many of the landscaping materials commonly used have enormously negative impacts on the environment and on the ecosystem they come from. As Dr Paul Gibson-Roy from the University of Melbourne's

Burnley College says, 'There is little point feeling good about your own garden if other areas of the planet are destroyed to provide the materials used in it.'

Think about the materials used in your garden. When choosing landscaping materials, try as much as possible to use materials that already exist on your site or are local. If you want stone, use local stone rather than stone cut and transported from the Kimberley region. Unless, of course, you live in the Kimberley.

Use recycled materials as much as you can. It might take a bit more time, but you can source recycled timber sleepers for your retaining walls, recycled timber for your decking, crushed rock or concrete for paths and mulch, even recycled glass as mulch.

Don't install metres and metres of paving or concrete. This only creates heat and water runoff. Lots of hard surfaces close to the house create a heat bank that heats up both outside and potentially inside your home. Instead of pavers, you can use garden plants and lawns, which also help to filter the air around your home to make it cooler in the hot months. Plants can also filter dust and slow down the wind before it hits your house.

Selecting your materials

You need to do a bit of homework to work out the environmentally friendly, sustainable credentials of your landscaping materials. If you have a sustainable landscaper or garden designer, they can point you in the right direction. If you want your landscape built by a professional, make sure you engage a sustainable landscaper who has the same approach and philosophy as you.

If you're doing it yourself, here's a guide for you to follow:

- Is there a recycled alternative? Old concrete can be crushed and used as fill or on paths. Old sleepers can be reused as edging, retaining walls or paths.
- Pebbles and river stones are very popular as mulch and for general garden decoration. Where do they come from? Do they come all the way from Asia or are they sustainably produced locally (see 'Pebbles, rocks, sand and stones' next in this section)?

- If you're after timber, always use local plantation-grown timber. Find out if it's radially sawn timber; this is a technique that produces more timber per saw log and reduces waste. Always avoid rainforest or old-growth forest timber.

The term *sustainable plantation* is sometimes used in misleading ways. Although plantation timber is a great alternative to using timber from native forests, be aware that, even if your timber is from a plantation, it isn't automatically sustainable. If native forest has been cleared to make way for the plantation, that's not a good, environmentally friendly move. The Wilderness Society says that plantations should be correctly placed so their impact on water yield, native species and the surrounding environment is negligible.

Look for and only use plantation timber that has been grown in forests established in accordance with globally recognised environmental best practices. In Australia and New Zealand, the Forest Stewardship Council (FSC) provides guidance. Check out their website at www.fsc.org.

Pebbles, rocks, sand and stones

So you love the look of pebbles as mulch, or you'd like a natural stream look around your pond and think river stones would be just perfect. Then finish it off with some nice big bush rocks. Wonderful! Well, maybe. That look you're after for your garden can devastate natural ecosystems. Taking rocks, sand and pebbles from any waterway is illegal in Australia, so where do these things come from and can they be sustainable?

Pebbles, rocks, sand and stones come from a variety of sources, with varying degrees of environmental impact. Here are the main sources:

- **Natural intact ecosystems:** Some of the sand, pebbles and stones that come from overseas, mostly parts of Asia, are mined from rivers, streams and beaches, with potentially devastating effects on those natural ecosystems. It's an environmentally disastrous practice.

- **Old watercourses:** Over time, rivers and streams change direction, leaving behind a dry bed of sand, pebbles and rocks. These deposits can be mined without disturbing waterways. Obviously, the landscape is still disturbed, but perhaps this is the lesser of two evils.

- **Designated areas:** Some sand is mined from strictly controlled designated areas. Some stones and pebbles are also sourced through this method. The sand is sieved, the stones separated and then tumbled to give them a shiny 'river stone' look. Sometimes they are dipped in wax to make them look even smoother and shinier.

- **Quarries:** Some nice-looking stones are the by-product of stone quarrying. They're the rubble left over from the extraction and cutting of stone for other purposes, such as building and monument masonry. They're usually tumbled to make them smooth, and some are polished.

  In Australia, if you buy stones and pebbles in bulk, they're mostly sourced from an Australian quarry and not from a river or any other active waterway.

- **Private land:** Rocks are usually collected from private land where farmers on rocky sites have cleared them from the paddocks, leaving great piles of them here and there. Collecting this way has a lower environmental impact, although removing them could destroy valuable habitat for reptiles and other critters.

- **Manufacturing:** I've seen some very realistic artificial rocks — if you're in New Zealand, have a look at the artificial cliff face in the native garden at Te Papa in Wellington. You can't tell the difference from the real thing. It's brilliant. Years ago a friend made her own fairly large garden rocks out of wire, cement and bits of recycled rubble. Today, they're scattered around her garden, even growing lichen and moss, and you can't tell they're not real.

If in doubt as to the source of these materials, ask your supplier. Insist on environmentally friendly, sustainable products. Never accept pebbles, rocks, sand or stone that are mined in any environmentally damaging way. If consumers stop buying these products, scores of natural ecosystems could be saved. It's in your

hands.

Paving

You probably don't ever think about paving as being either sustainable or an environmental nasty. I was landscaping for years before it occurred to me that large paved areas potentially do more damage than good.

Large hard surfaces are generally non-permeable; that is, when water hits them, it runs to the lowest point. If it's not drained properly, it causes flooding. If it does flow into a drain, it runs into the stormwater system and out into the waterways. Nothing wrong with that, right? Wrong! Think about all the muck that might be picked up and carried into the waterways by that water — fertilisers, oil, detergent and all manner of other nasty pollutants. Not to mention the fact that, during a heavy rain event, non-permeable surfaces can make water run off fast, causing not only flooding, but erosion as well.

By installing a *permeable* surface — that is, a surface that water can penetrate — you slow down the flow during a heavy rain event and keep more water on site. Water can slowly soak into the soil, where it contributes to the preservation of the natural water cycle. You can also keep the pollutants from getting out and causing untold environmental damage.

By far the best permeable surface for your sustainable garden is gravel or some kind of wood mulch, but that's not always ideal to put down in your barbeque area.

The best compromise is to lay pavers in such a way that leaves gaps in between each paver for water to penetrate. The gaps only need to be about a centimetre, just enough to allow water to soak through rather than run off.

Think about the look you want at your place and what sort of permeable surface you can use for any utility areas.

If it's a high-use area for outdoor entertaining, you probably want a hard, even surface. You can achieve this either with pavers or with crushed rock such as Lilydale Toppings. This fine rock can be packed down with a plate compacter to produce a nice even and quite hard

surface. Just remember, it won't last forever and you might need to top it up every few years.

If it's pavers you want, some fantastic permeable pavers are available. These pavers actually let water run right through tiny holes, ensuring vital water trickles down to the soil. They look pretty much the same as any other paver. You can use a mix of these and standard pavers to improve water retention and reduce runoff. I've seen these pavers in all sorts of sizes and colours, and made from anything from recycled concrete to recycled plastic.

Timber

Many gardeners, not surprisingly, want a natural look for their gardens, and timber landscaping products seem to fit the bill. But, as with pebbles, rocks and sand, you need to be careful about where the products have been sourced, even for mulch. For many uses, recycled timber can be the answer.

Sleepers

Wooden sleepers are commonly used in all sorts of landscapes in all sorts of ways. You can use them as retaining walls, borders, steps, walls for raised garden beds, even as big, heavy outdoor tables. In Australia, many sleepers are made from red gum harvested from our precious native red gum forests. If you do use red gum sleepers, look for recycled railway sleepers rather than new ones. A good alternative is to buy plantation-harvested sleepers made from blue gum. In some areas you can get sleepers cut from old cypress trees planted 40 or 50 years ago as windbreaks on farms.

Edging

If you really must have an edge on your garden beds, avoid karri and jarrah edging that seems to be readily available in many hardware stores and garden centres, unless you're sure it has come from sustainable forests or is recycled. The linked semicircles of timber you sometimes see as edging can be great and easy to install in a low garden. You just roll them out and secure them with pegs. These are usually plantation pine, so just make sure the timber isn't treated with nasty chemicals. Great recycled plastic edging is on the market these days in all sorts of colours and shapes. Some are even made to look like bluestone blocks or even old-style terracotta tile edges.

Mulch

Every sustainable gardener knows and understands the value of mulch in the garden to suppress weeds, hold on to precious soil moisture and improve the soil, so mulch made from wood products must be good, right? Well, yes and no.

Some people love the look of woodchip or bark mulch on their gardens and there is no doubt that a good chunky bark mulch does good things for your soil. However, before putting any wood or bark mulch on the garden, find out where it comes from. Go for material from plantation timber rather than that sourced from native forests. A few years ago you could buy a 'leaf litter' mulch that was actually collected from the floor of native forests. Removing this stuff causes all sorts of problems for the ecosystem it's taken from. For more information on mulch, check out Chapter 9.

Garden Features

Think about that beautiful wooden outdoor setting you have your eye on to add that perfect finishing touch to your sustainable backyard. But what kind of wood is it actually made from? If it's teak, it's most likely timber sourced from rainforests in Asia; if it's jarrah it may be made from wood logged from old-growth forests in Western Australia.

Garden furniture

Always choose garden furniture made from sustainable plantation timber, or look for furniture made from recycled plastic or rubber. In fact, some of the recycled plastic stuff I've seen is made to look like timber and actually looks quite convincing — well, from a distance anyway. What a great use for all that plastic that otherwise might end up in landfill.

Quite a few companies in both Australia and New Zealand make all of their garden furniture from certified plantation timber. A quick search on the web should lead you to them.

You can also buy some beautiful furniture made from recycled timber,

often from the demolition of old buildings. Some products now are even made from plantation bamboo and are worth checking out.

Pots

You may not give much thought to the environmental credentials of your garden pots. But you should. One of the main problems with pots is their huge carbon footprint, due mainly to the fact that most available in Australia and New Zealand are imported. Factor in the carbon footprint of their manufacture, and several modes of transport to get them from Italy, China, Vietnam or other far-flung places to your place, and it starts to get pretty big.

Look for locally made pots and look for pots made using the least energy. The most energy-efficient method of firing pots is gas, the least is coal or wood-firing. Locally made pots make sense both environmentally and economically. You're supporting local business and reducing the greenhouse gas emissions from transporting them vast distances.

You don't really need to be an expert in pottery to be able to tell what method has been used to fire a pot. With imported pots, you can tell by where they come from.

Use this guide if your pot is from one of the following countries:

- **Indonesia:** Unglazed pots are wood-fired.
- **Vietnam:** Unglazed pots are fired using either wood or rice husks.
- **China:** Glazed pots are usually gas-fired, although some are fired with coal or oil.
- **Malaysia:** Glazed pots with raw rims are produced using gas.
- **Italy:** Pots are of a high quality and are gas-fired.

Not Keen on DIY Landscaping?

If doing all your own landscaping is beyond you — and, let's face it, sometimes some jobs are best left to the professionals — look for a landscaper who understands and adheres to sustainable landscaping principles.

In Victoria, Sustainable Gardening Australia has set up the ECLIPs program, which stands for Environmentally Certified Landscape Industry Professionals.

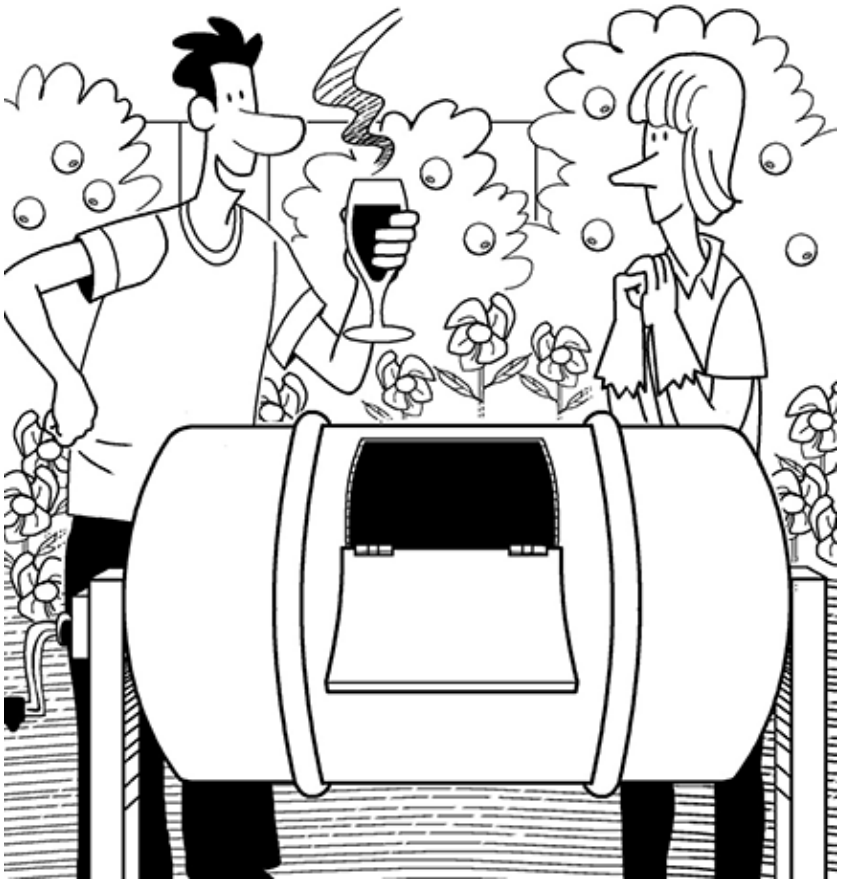
Landscapers who pass this rigorous accreditation program always adhere to environmental best practice, and you can count on them for expert advice on all aspects of environmental landscaping.

If you're outside Victoria, quiz your landscaper on his or her knowledge of sustainable and environmental best practice. Some brilliant and very skilled professionals consider the environment in all they do.

Part III

Developing Healthy Habits in Your Yard

Glenn Lumsden



‘Full-bodied and cheeky, with just a hint of the barnyard . . . I believe the 2009 compost will be my best vintage yet.’

In this part . . .

I know I try hard to maintain my own health to ensure I function well. The same goes for my garden. Gardening sustainably leads you to an understanding that the health of the whole garden is important, because a garden is a part of the 'big picture'. In fact, it is an ecosystem within an ecosystem, rather than something that exists as an isolated entity.

In this part, I look at one of the most important aspects of sustainable gardening, the biodiversity of all the plant and animal species that live in your garden, and depend on it to survive and thrive. Think about the birds and the bees — where would you be without either of those critters? You'd have very few fruit or flowers; these precious pollinators keep the balance of our ecosystems and help produce our food.

You also get some great information on how to grow plants that are fit and healthy, and how to make the most delicious, sweet-smelling compost to help keep them that way, as well as the importance of mulch. Compost and mulch both help attract the hardest workers in your garden, even if they are slimy. Here you find all you ever wanted to know about earthworms, worm farming and what to do with the by-products.

Chapter 7

Returning Biodiversity to Your Backyard

In This Chapter

- Understanding biodiversity and how it relates to your backyard
- Planting to help improve biodiversity
- Bringing furry critters into your place
- Encouraging birds, frogs, reptiles and insects

Biodiversity seems to be another of those trendy words bandied about, but what does it really mean? And why is it important to sustainable gardening? Here are a couple of dictionary definitions:

> *The number and variety of organisms found within a specified geographic region.*

> *The variability among living organisms on the Earth, including the variability within and between species, and within and between ecosystems.*

So, what does that actually mean at your place? In this chapter I take a good look at the concept of biodiversity and its context in your backyard. Basically, biodiversity is all about trying to get a good variety of living things in your garden to create harmony and balance. Living things are not just plants, but animals, insects, lizards, frogs, birds and butterflies — right down to the microorganisms living in your soil. They each have an important and interconnected role to play in maintaining the health and life of the planet, and later in the chapter I examine those roles. You may think that your backyard is too small to make a difference on a global scale but, no matter how small your contribution seems, every bit helps.

By helping to maintain biodiversity or even bring it back to your backyard you're doing your bit to preserve all native plant and animal species, no matter how small. The rich biodiversity of an area makes

that place unique, defining its natural character.

What Is Biodiversity?

The term *biodiversity* is actually shorthand for biological diversity. Biodiversity is the rich variation of plants and critters in a natural ecosystem. Think of a field of sugar cane. With hectares and hectares of a single crop, this is definitely not a haven for biodiversity. The sugar cane field is a *monoculture*. A vast area of a single plant species can become dependent on chemicals to control any pests that happen to drop by. It becomes a host for diseases or a huge food source for pests that will gorge themselves and then multiply rapidly. This situation causes a huge imbalance and allows pest populations to build up and wreak havoc with little or no natural intervention.

Mass plantings of a single species or only a few species can give you your very own monoculture at your place. That's exactly what's happening in some of the modern, 'water-wise, low-maintenance' gardens. Although being water-wise is a good thing in itself, the practice does seem to be promoting a limited range of plants, which I delve into a little more in 'Garden trends' later in this chapter (also check out Chapter 11 to find out the difference between water-wise, drought-tolerant and climate-friendly plants).

Biodiversity takes in a whole range of things, including:

- Every different species of plant, insect, animal, fungus, bacterium and tiny microorganism in any area, which could be as large as a forest or as small as your courtyard.
- All of the genes of all of those species.
- All the ecosystems those plants, animals and other critters together create, such as forests, grasslands, sand dunes, heathlands, wetlands and estuaries.

Pretty big isn't it? So you can see biodiversity is quite an important thing to look after.

Biodiversity gives your area or country its unique character. Both Australia and New Zealand are host to native species of plants and

animals that occur nowhere else on Earth. Wow, that's definitely something to preserve and be proud of.

So how does all that relate to your backyard? Same principle, only on a smaller scale. You may not have a huge, complex and diverse ecosystem at your place, but by getting to know and understand the biodiversity of your area, you can help to preserve and maintain it.

Some things that affect biodiversity

The biodiversity of an ecosystem can be affected by all sorts of things, but three aspects of change stand out for their effects on the environment.

Changing climate

Climate change is the big one! Look around you and you'll see that, in many parts of Australia and New Zealand, things are changing slightly. Perhaps it rains at slightly different times, some plants flower and fruit earlier or later than usual. In many areas, water is becoming alarmingly scarce, average rainfall is predicted to decrease and it might just be a bit warmer than in the past. In other places, rain is more plentiful than usual. In fact, an increase is evident in what meteorologists call *extreme weather events*, which are storms, floods, fires and other displays of the forces of nature.

Whether all of this is caused by human activity or is some cyclical pattern, I really have no idea. I'm a gardener not a climatologist! But I have noticed that things are changing. So, as a gardener yourself, if you want to keep gardening, you need to adapt to the changes, gardening in a way that doesn't threaten the planet. If you live in an area where the average rainfall and water storage levels are decreasing, you need to change the plants you grow or the way you water them to cope with a lesser supply.

Destruction of habitat

Things are tough enough for native plants and critters, but in some

areas they also have to deal with the clearing of their natural habitat for housing, roads and other sorts of development.

One of the major contributions to destruction of habitat is insensitive clearing. This fragments native vegetation and animal populations, leading to loss of biodiversity. Planting native shrubs and trees in your backyard can help to fill the gaps that fragmentation creates. Developers also have a tendency to clear everything on a newly created development site, including 'dead' material on the ground that plays an important habitat role for many animal species.

Huge problems can also be caused when builders or developers or whoever also clear away the topsoil from the block when they clear the building site. In some cases the topsoil is sold off. The new homeowner discovers they're trying to build an indigenous garden on the subsoil that was underneath. Or maybe a new lot of soil has been brought in, which looks very nice I'm sure, but isn't suitable for the indigenous plants of the region. These plants thrive not only in the local climate, but also the local soils. Taking away precious native soil takes away all of the native soil flora and fauna that indigenous plants need to survive and thrive.

Trees, dead or alive

In Victoria's Glenelg Shire in the state's south-west, even dead trees are protected because they provide important habitat for native critters, in particular, the endangered red-tailed black cockatoo. This protection is an important recognition of the value of all plants, dead or alive, and the role they play in maintaining precious biodiversity.

Clearing of native habitat often threatens native birds and animals, causing them to move further afield in search of suitable habitat or making them dependent on weed species to survive.

Garden trends

The trend for low-maintenance and water-wise gardens may very well lead to the loss of biodiversity in the plants available in nurseries and garden centres. In many nurseries all you see are rows and rows of plants with labels that proclaim them to be 'drought-tolerant', 'easy-care', 'water-wise' and the like. That's a great thing to see, but they aren't the only properties of a good plant for a good sustainable

garden.

One of my concerns is that some nursery plants are becoming a bit like some of the fruit and vegies in the supermarkets, bred for ease of growing and ease of transportation. Newer housing developments around the major capital city nearest to my place seem to harbour endless gardens of strappy plants and pebbles. Sure, some of them look great, but is this practice creating vast urban monocultures? Is there a danger of losing what little biodiversity is left in urban landscapes? I fear that may be the case.

So where do you start?

When considering planting a sustainable garden to promote biodiversity, a good place to start is to ask yourself a couple of questions:

- Do I know the biodiversity of my particular region?
- What do I want to achieve?

Australia and New Zealand are made up of dozens and dozens of different areas called *bioregions*. Each bioregion may be home to many different plants and animals, though some, of course, might overlap. Get to know your region and aim to enhance or recreate its biodiversity.

One way to get to know your area, particularly if you've just moved in, is to ask those in the know. Join a local native plant group or, if your local council has an environment officer or even a whole department devoted to the environment, give the council a call. I give you a few good contacts to start with in the section 'Planting for Biodiversity' later in this chapter.

When you learn all about the biodiversity that exists or used to exist around your place, you'll be eager to get stuck in and create a rich tapestry of all the original plants and animals living in harmony and perfect balance in your garden. A place where no exotic creature (read introduced species, not fan dancer!) dare enter, where you can sit and sip pots of tea and enjoy all that nature has to offer, right? Well, maybe not quite.

Whether or not you can create your dream will depend on a whole bunch of things. Here are just a few to think about.

How big is your plot of land?

Just because your backyard is 10 metres by 10 metres doesn't mean you can't create a haven for biodiversity, just maybe not *all* biodiversity. Micro-ecosystems exist even in the natural environment. Think about what it is you want to create at your place. Be realistic.

Can you fit all the native plants and animals in it?

Probably not. Perhaps your backyard doesn't quite provide enough room for you, the native bush and a mob of kangaroos or kiwis. Be realistic again. Maybe the native critters you can aim to attract are butterflies or insects, or some colourful passing birds.

What are you trying to do?

Maybe you want to capture or preserve views of existing habitat. Your house may be beside a magnificent wetland and you just want to look at it. A friend of mine lives in just such a place and she has very few plants around her house. She's a keen gardener so at first I was a bit puzzled by her distinct lack of garden, but she has built her house to take in the views of the wetland and all the magnificent plants and animals living there.

Or perhaps you want to extend or preserve an existing habitat. Many people build houses tucked up in the bush or nestled against a sand dune so that the house almost becomes part of the environment. A whole stack of issues arise here, particularly if you live in a fire-prone area. You may build your house in a quiet natural setting, expecting to live in harmony with nature and enjoy close-up encounters with the wonderful native critters. You may enjoy their company, but they may not take very kindly to you. Lights, noise, vehicles, even washing flapping on the line can be very disconcerting to native wildlife and they may well pack up and go.

You may just want to bring frogs and insects, or provide food and shelter to native birds. If that's your aim, you need to create a haven for them.

One of my favourite ways to bring biodiversity to my backyard is through my food garden. You can do this by growing *heritage* varieties of fruit and vegetables that have been passed down through generations rather than bred as hybrids, saving and swapping seeds.

You could also try out some of the native tucker and try, as much as is practical, to eat only what's in season. These practices can help to ensure the continued biodiversity of food crops.

Who uses it?

In your eagerness to create a wonderland of biodiversity at your place, don't forget to stop to consider who uses your garden and what it's actually for.

If you have small children, the garden is a wondrous place for them to play, run, yell, create and learn, and, of course, you should encourage them to be out in it as much as possible. However, timid birds, frogs, furry critters and kids are not always a good mix. Short of sending them off to boarding school from the time they start walking, or banning them from the garden and making them sit inside playing computer games, be realistic about what native creatures will call your place home and set some ground rules for the kids, such as not picking up frogs (the acids on your fingers can damage their skin).

A garden has to be a place where the whole family can get outside and enjoy it, where the kids can kick a footy around without fear of scaring the birds or squashing the frogs.

Planting for Biodiversity

By following sustainable gardening principles you will help to maintain or bring biodiversity back to your backyard. You can do this in a few simple ways, but the most important thing to understand, after getting to know the biodiversity of your area, is which plants are right to use. Your plan for a sustainable biodiverse garden should include as many indigenous plants as possible.

Planting local species will attract local wildlife, so here are a few guidelines:

- Plant thick prickly bushes to provide nesting places for smaller

birds.

- Provide plants that produce flowers, seeds and fruit as food for wildlife.
- Leave logs, sticks and leaf litter to provide habitat for lizards, insects and bugs.
- If you can, provide water, maybe a pond or a birdbath.

So what are indigenous plants? Aren't they just native plants? Well, yes they are, but indigenous plants have a further distinction. An *indigenous* plant is a plant that is native to a specific area, and that area can be quite small. A *native* plant, on the other hand, is a plant that is native perhaps to the whole country. Bear in mind that, in some areas, plants native to the country but not that area may be classified as weeds. One good example is Cootamundra wattle (*Acacia baileyana*), a native of the Cootamundra area in New South Wales that has become a serious environmental weed outside of its indigenous zone. This wattle has the ability to interbreed with local indigenous species such as silver wattle, leading to displacement of that species, as the progeny's physical features are mixed up — the new tree is neither one nor the other.

Indigenous plants should be your first choice when starting your sustainable and biodiverse garden, because they:

- Suit the local soil and climate.
- Help to preserve the local plant ecology and contribute to the distinctive character of the area.
- Provide much-needed habitat, shelter and food for native wildlife.
- Enhance precious wildlife corridors and help to provide links between fragmented and otherwise isolated natural communities.

To find out about the indigenous plants around your place in Australia, here are some useful places to start:

- The Australian Native Plants Society (Australia), or ANPSA, formerly known as the Society for Growing Australian Plants (`http://asgap.org.au`)
- Greening Australia (`www.greeningaustralia.org.au`)

- Sustainable Gardening Australia (www.sgaonline.org.au)

Your local council or catchment management authority may also provide information and links to websites on indigenous plants and biodiversity.

In New Zealand, check out these organisations:

- The New Zealand Plant Protection Society (NZPPS, www.nzpps.org)
- New Zealand Gardens Online (www.gardens.co.nz)
- The New Zealand Department of Conservation (www.doc.govt.nz)

Another thing to consider when you're exploring indigenous plants is the concept of *local provenance*. This means that, although a particular plant species may grow across a wide area, it may have adapted to quite specific conditions and be genetically quite different from the same species 20 kilometres away.

A plant that has adapted well to one small area won't necessarily thrive in another. For example, you might drive to the coast and find a magnificent native plant with loads of seeds. You know you've seen this same plant species growing in the bush near your place 30 kilometres inland. Being the thrifty gardener you are, you collect some seeds to grow some of these plants for your place, only to find that they struggle and many of them die. Same plant, different conditions. What's going on? Well, that's the wonder of genetic diversity in nature. Even the same species of plant adapts over time to different conditions; it's all about survival. When you're planting indigenous species, try to make sure that the *propagating material* (that is, the seeds or cuttings you're growing from) was actually sourced locally. Also bear in mind that in some areas collecting seeds or parts of native plants is illegal without a permit. If in doubt, find out.

Weeding out the weeds

No matter what plants you select to bring biodiversity into your sustainable garden, you need to make sure they're the right plants for

your place and that you're not introducing weeds.

However, exotic (or introduced) plants, whether they come from another region or another country, can have a place in helping to maintain biodiversity. In most cases, the native critters that you're hoping to attract don't actually care where the plants come from; they just want somewhere to live and have a feed. For example, salvias are certainly not native to my neck of the woods but that doesn't stop flocks of native New Holland honeyeaters from gorging themselves on the flowers. Just remember not to introduce weeds.

Weeds are becoming more and more of a problem in Australian and New Zealand natural landscapes. A *weed* is classified as any plant that invades and threatens native vegetation or primary production areas. Weeds cross all boundaries and have the ability to destroy huge areas of native bushland and the habitats of native animals. Check out Chapter 19 for more facts about weeds. Weeds are everybody's responsibility, and the combined effort of everyone is needed to try to halt their spread. A combined community approach to weed control can increase and protect local native vegetation and habitat.

For more information on identification of weeds and efforts to control them in your area, contact your local council or, on a national scale, in Australia check out the federal government site at `www.weeds.gov.au` and in New Zealand Manaaki Whenua — Landcare Research at `www.landcareresearch.co.nz`.

Feeding yourself through biodiversity

Another important way to maintain biodiversity is through food gardens. If you already have or are planning a sustainable vegetable garden, think about growing heritage varieties, rather than the sterile hybrid varieties of fruit and vegies now commonly available. Much of the fruit and vegetables that we buy in the local supermarket are for the most part bred and grown for ease of harvest, storage and

transportation, often at the cost of flavour.

Here are a few ways to maintain biodiversity in your food garden:

- Grow heritage varieties, as this helps to maintain the biodiversity of food crops.
- Try companion planting as a way of using plants to deter or attract insects, or possibly even diseases, and to improve the soil, making it less reliant on chemicals. Chapter 8 has some good tips on companion planting (also called guild planting in permaculture practice, which I cover in Chapter 16).
- Save seeds to help to preserve the diversity of food crops and, of course, save you money.
- Mulch and add lots of organic matter to your soil to encourage millions of healthy microorganisms that make up a biodiverse living soil (see Chapter 9 for more on mulch).

She'll be apples

In ancient Roman times, about 23 types, or *cultivars*, of apples existed. By 1900, the number of domestic cultivars had grown to more than 4,000. Today, more than half of those have disappeared and the other half are endangered species. Less than 50 apple cultivars are now available in Australia. Among them, about 10 commercial cultivars predominate, being easy to transport and harvest, lasting for up to eight months in cold storage. A few Australian heritage varieties that are gaining in popularity, particularly among sustainable gardeners, are 'Cox's Orange Pippin', 'Gravenstein' and 'Snow Apple'.

Save the strawberry!

When you think of an endangered plant species you usually think of something out in the wild, a rare and endangered orchid perhaps. Endangered species exist among our food plants as well. Some varieties of strawberry are in danger of becoming extinct, simply because strawberries are selectively bred for size, transportation and storage. Producers pick these giant strawberries before they're properly ripe so they can get them to the supermarket before they spoil. As a result, the sugar levels haven't developed sufficiently to give that delicious strawberry flavour. The resulting strawberry you buy often looks big and sweet and delicious but is, in fact, only big! A couple of the endangered varieties are 'Hokawase' and 'Cambridge Rival'. Look out for these from specialist nurseries and get some to plant at your place to do your bit to help save an endangered species.

Fancying Furry Critters

You can attract all sorts of cute, maybe not so cuddly, furry critters to your garden. It depends really on where you live and what furry things are native to your area. It could be koalas, bats or possums. By attracting these critters to your sustainable garden you're helping to maintain habitat for them, although some creatures can quickly become pests. You might fancy the idea of creating a haven for possums, but they may find the fruit and many of the flowers in your sustainable garden particularly tasty.

If possums or fruit bats are wreaking havoc on your ripening fruit crops and aren't welcome in your sustainable garden, you can deter them by practising *exclusion*; that is, preventing them getting to your fruit. In New Zealand, where possums are an introduced pest, they can be legally baited. For some clever ideas on exclusion strategies, check out Chapter 12.

Get to know the mammals or marsupials native to your area and find out what plants they prefer as both a food source and habitat, and if it's practical to include these plants in your sustainable garden.

Going batty in New Zealand

If you're thinking native furry critters, you're probably thinking bats, either the long-tailed or short-tailed bats, depending on where you live. The long-tailed bat is widespread, but the short-tailed bat is found only in a few isolated areas in the North Island and occasionally on the South Island. Both these little guys are threatened. In fact, they are the only surviving native land mammals in New Zealand.

Go home, Aussie, go home!

If you're Australian, you may find it hard to believe that possums are a pest in New Zealand; likewise, if you're a Kiwi, you'll be bewildered at the lengths some Aussies go to protect their possums.

In 1837, some bright spark from Australia thought it would be a good idea to bring some brushtailed possums over to New Zealand to start a fur trade. In fact, it was such an historic event, that schoolchildren in the Wairarapa district got the day off school! At the height of this enterprise, trappers killed 20 million possums a

year, which went some way to controlling them. They are now found just about everywhere there are trees, and that includes your place.

Possums also eat anything, although mainly plants. But, most distressingly, they eat New Zealand native birdlife such as the chicks and eggs of kokako, kereru, fantail and muttonbird, and push kiwi out of their burrows. They'll even eat weta. Nasty little critters! Current estimates have the population at about 35 million of the furry devils in New Zealand, and only 4 million New Zealanders!

To create a habitat at your place for these fellas, make sure you don't knock down any old trees. They like to live in them, using them both for roosting and breeding. New Zealand bats have a preference for red beech (*Nothofagus fusca*), in particular, and dead trees are their favourites. The long-tailed bat eats mosquitoes, moths, beetles and midges.

Playing possum in Australia

Australia has numerous mammals and marsupials, and many of them aren't shy of urban areas. If you live in the bush you often get to see whatever lives in your region, but in the suburbs some of the native furry critters you may find at your place include:

- **Koalas:** If you're lucky enough to have koalas in or around your backyard, take good care that domestic pets don't get to them and that you keep a watch out on local roads.
- **Kangaroos and wallabies:** Similarly, in some parts of Australia kangaroos casually graze on suburban lawns in the early mornings and evenings, but care needs to be taken to keep dogs, and cars, at bay.
- **Possums:** Brushtailed possums are particularly common even in city suburbs, and ringtails are also found in some areas. Again, pets and cars are the greatest threats. Some people use possum boxes to encourage possums not to inhabit roof cavities but the boxes can create problems too, by encouraging introduced birds, which find them a convenient nest!
- **Wombats:** All three species of these chubby, burrowing nocturnal animals are listed as either endangered or vulnerable. If they live where you do, from time to time they might wander into gardens. Leave them alone and protect them from pets.
- **Spotted quolls:** This rare and endangered hungry critter is an

excellent hunter and scavenger and can travel several kilometres in a single night hunting for food. As more and more of their habitat is destroyed they head into urban areas and farmland in search of a tasty meal. They've been known to feast on ducks, chooks and their eggs, or even the odd pet guinea pig from time to time.

- **Echidnas:** They're not strictly furry but they are cute. These odd-looking spiky critters are becoming more common in urban areas, particularly where waterways have been restored and revegetated, creating the perfect wildlife corridors. If you have one at your place, don't move it out as it might be a mum with a burrow and babies nearby.

- **Native mice and bush rats:** Species of native mice and particularly the poor old bush rat often get mistaken for introduced mice and rats (*Rattus rattus*), or mistakenly pick up baits intended for the rodents you don't want around. Never use baits in outside areas (they kill pets and all sorts of wildlife as well); actually, avoid baits altogether — use traps in your home if rats or mice are a problem!

- **Dunnarts and bandicoots:** Probably not as common in suburban areas as some other marsupials, but they get the same bad rap as native mice and bush rats, and are also threatened by domestic pets.

- **Bats:** Many species of bat inhabit caves and groves of trees, particularly around watercourses, darting around in the twilight to collect insects. Unfortunately, fruit bats also enjoy your fruit, but they're protected, so you may just have to learn to share!

And the list goes on. In fact, there are around 300 mammal species in Australia, including 140 species of marsupial. Most of them are found nowhere else in the world, which is a good reason for looking after them, I reckon. If you can, within reason, find a home for them at your place.

One of the major problems these critters face is fragmentation and loss of their habitat. By creating wildlife corridors and establishing food and shelter plant species at your place, you can help to maintain the biodiversity of your own backyard and give the animals a fighting chance.

Get to know the plants they like, both for food and habitat, and plant as many as you can. Make sure you include a variety of locally indigenous species. You may need to also plant an understorey with

dense prickly shrubs to help deter predators like foxes and cats.

You may well have seen signs in national parks and state forests that say 'Don't Feed the Wildlife', and hopefully you don't. Conflicting opinions seem to exist on whether or not you should feed indigenous fauna. My answer to this question is *no!* They can become dependent on the food supply and forget how to find food for themselves, which can be a real problem if you go away on holidays and the animals suddenly find the food has dried up. Native animals and birds accustomed to artificial feeding can actually die. They can also become rather aggressive and attack people for food. You might have experienced this in campgrounds and urban areas. Human food often contains additives, preservatives and chemicals that can make native fauna sick and even kill them. The best way to provide food for native animals at your place is to find out what it is they like to eat, whether that be plants or even insects, and provide the ideal conditions for a reliable supply of food.

Feathering Their Nests: Birds

When planning to attract native birds to your sustainable backyard to increase the biodiversity, just remember that you will probably, depending on where you live, attract introduced birds as well. The aim is to provide the ideal habitat with somewhere for birds to nest and feed. Unfortunately some introduced birds are opportunistic predators and will move in en masse and scare your native birds away.

In eastern Australia, for example, the common starling was introduced in the late 1850s. You often see them in vast flocks searching for seed and insects on your lawn. They also eat spiders, worms, food scraps and fruit crops. They nest inside the roof of your house, are noisy and smelly, and will kill baby native birds and force mothers off their nests. Although a steady natural food supply attracts both native birds and starlings, don't be tempted to provide commercial birdseed — that just makes sure you bring in the starlings!

Get to know the native birds in your area and plan your garden with as many plants to attract them as possible. The habitat of many native birds is seriously threatened and, while you may not have room for enough trees at your place to save or expand their habitat, you may have room for one. Then your next door neighbour can plant another one, then another in the next yard, and so it goes on until you find your neighbourhood has created an urban forest and a wonderful home for your native birds.

Just remember, of the many different types of birds, some eat seeds, some eat insects, nuts, fruit and nectar. Make sure you aim to provide the right food for the birds that live in your area.

To get some good information on native and even introduced birds, check out www.birdsaustralia.com.au or www.nzbirds.com.

Most native critters in Australia and New Zealand have few needs — food, water and somewhere safe to breed. In your sustainable garden, aim to provide a year-round supply of food — flowers or seeds — and maybe some water.

Croaking It: Frogs

Frogs are great things to attract to your garden. Everybody loves a frog. In fact, someone told me frogs are the new dolphins, and are probably easier to keep at home than a dolphin. Everybody wants to know about their local frogs. Most people are concerned about the decline in frogs and their habitats. Some probably remember collecting tadpoles as kids and watching in wonder as these funny little creatures grew legs and lost their tails, then hopped up on land.

The suggestion is that urban sprawl has reduced frog habitats and is contributing to their decline. However, most of the frogs currently listed as threatened with extinction in Australia live outside developed areas.

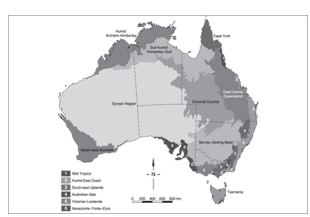
Plenty of non-endangered frogs do live in urban areas, however, and can be a barometer of the health of your garden. By creating a sustainable garden, attracting lots of beneficial insects and planting the right plants, you can create a haven for them.

If you want to encourage frogs to your backyard, the more natural the environment the more likely they'll move in. The biodiversity of frog species may be lost if sustainable gardeners don't try to provide some habitat for their local frogs. Remember, though, that in most states of Australia some sort of legislation exists that prohibits you from collecting frogs or tadpoles.

To make your garden frog-friendly, investigate what frogs live in your area and what habitat they prefer. You may be surprised to know that your garden may already have a few frog residents. It can be hard to find them and often you won't see them, but you will hear them.

The Frogs Australia Network provides an interactive map of frog bioregions that tells you what frogs live in what region. The non-interactive version is shown in Figure 7-1. Go to `www.frogsaustralia.net.au` to try it out.

Figure 7-1: Australian frog bioregions are based on the similarity of vegetation, soils, climate, geology and landforms in each region.



Source: IBRA

In New Zealand, native frogs are very different. They are never tadpoles, but develop into frogs inside a kind of gelatinous capsule.

They also have tail-wagging muscles, even though they have no tail, and they don't actually croak but make a high-pitched squeak. New Zealand has four native frogs and three introduced species. All the natives are endangered or vulnerable. Telling the difference between the locals and the others is easy — the locals are much quieter!

Check out www.nzfrogs.org for all you need to know about frogs in New Zealand, including details on New Zealand Frog Week, held in September each year. Australians can log onto www.frogs.org.au, a great website from the Amphibian Research Centre, where you can learn everything there is to know about Australia's frogs. You can even click on a button and listen to their calls. I've spent many hours late into the night doing just that! This site also gives you great information on how to build a frog pond (click on the link for Frog Watch, which offers a booklet delightfully titled *Bonking in the Garden*). Figure 7-2 shows a diagram of a frog pond to get you thinking.

Save the frogs!

The inaugural worldwide Save the Frogs Day was on 28 April 2009. Habitat destruction, pollution, climate change and a deadly fungal skin disease are the main threats to the world's frog populations. This day helps to raise awareness around the world of the precarious situation of frogs. Check it out at www.savethefrogs.com/day.

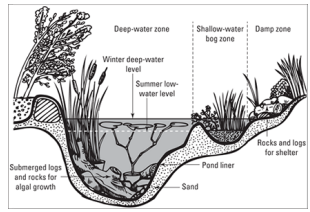


Figure 7-2: A frog pond is a great way to make your garden frog-friendly.

To create a frog-friendly habitat at your place, here are a few points to remember:

- Get to know your local frogs.
- Don't use chemicals in your garden.
- Have moist friable soil.
- Don't put goldfish in your pond; you could have native fish if you like but do your research first.
- Don't allow your cats outside and alert the appropriate authorities if you have feral foxes in your area. Feral cats have been found with several dozen frogs in their stomachs.
- Try to use local plants where possible.
- If you already have frogs and plan to modify their habitat in your yard make sure you don't do this during breeding time or tadpole season.

Not all frogs can live in your backyard. Because frogs are seasonal, they move around. Just because you have frogs now doesn't mean they'll still be there next month — they are travellers and will go to wherever suits them at the time. Create an environment they'll come back to time and time again.

Of frogs and toads

Never confuse a frog with a cane toad (Australia doesn't have native toads)! These nasty critters were introduced into Australia in Queensland in 1935. They were supposed to control beetles that were destroying the sugar cane crops. Well that was a dismal failure, and the cane toad (*Buffo marinus*) quickly became a major pest, with no natural predators and a voracious appetite for the local wildlife.

In fact, cane toads eat anything they can fit into their mouths — lizards, snakes, frogs and their tadpoles, marsupials, mice, snails, even your dog's food! They are poisonous to larger animals that try to eat them and, so far, no-one has come up with a way to control them.

Their westward movement across Australia is estimated at about 27 to 50 kilometres a year, and they are now even heading south at about 1.3 kilometres a year. These unpleasant pests are a major ecological disaster, posing a serious and uncontrolled threat to the biodiversity of Australia.

Scaling It Up: Reptiles

The reptile population of New Zealand consists of geckos and skinks, and of course tuatara. Despite looking a bit like a lizard, the tuatara isn't one. Tuatara can grow to about 60 centimetres long and live up to 100 years. However, you're not likely to have them in your backyard, they are now only on offshore island refuges and are endangered.

In the Wellington area of New Zealand, you might find any of eight common lizard species at your place. Some are living happily, whereas others are vulnerable because their habitat is under threat and they're being eaten by birds, cats and other mammals.

However, in Australia, an enormous range of reptiles exist, from crocodiles to tiny water skinks. If you want to attract reptiles of any sort to your backyard, you need to know the locals. If your local reptiles are crocodiles perhaps you won't be encouraging them.

Lizards like dark protected places to hide and you can easily provide these in your sustainable garden by half-burying old logs and rocks. The rocks serve a dual purpose because the lizards also like to sun themselves on them and absorb their heat. So put rocks or even some pavers in an open sunny area protected from wind. Leave any leaf litter and bark around as this provides habitat not only for the lizards but also for the snails, slugs and bugs they like to eat. They also need access to water; for blue-tongue lizards, for example, a birdbath sunk into the ground, filled with sand and kept wet is usually enough.

Many reptiles are on the endangered list. Threats to these creatures include:

- Destruction of habitat by clearing, ploughing and mining, as well as urban and industrial expansion
- Overgrazing, which threatens grassland species, changing the type of vegetation and causing soil compaction and erosion, and destroys the litter or vegetation layers of the soil
- Domestic animals such as cats and dogs
- Use of pesticides, which may not actually affect the lizards but kill

their food source (snail bait is particularly nasty and will kill most lizards)

- Use of fertilisers and herbicides
- Declining water quality and quantity

To get a particular species of reptile into your garden, you need to find out the habitat and, in particular, the indigenous plant species they need. For example, if you're after geckos, they love vines that connect their habitat and make it easier for them to move from place to place. And in southern Victoria, the endangered corangamite skink loves the fruit of the volcanic plain tree violet. So, if you live around there, plant lots of these violets.

No matter if you live in Wellington or Perth, you need to plant things that your lizards love, such as:

- Different heights and shapes
- Plants that give them protection from predators
- Thick ground covers to give them somewhere to hide out or to simply rest
- Clumping plants to create leaf litter and other plant debris
- Plants that provide food

If you want to encourage lizards to your place, get to know their needs and learn about their behaviour. Be patient; if you create the right conditions, they'll move right in. And if they don't appear, hopefully they've found a better place down the road and are safe. Be aware that lizards generally love a messy, untidy garden. If you like to keep your garden neat as a pin, the lizards will go elsewhere. In Australia, encouraging and creating habitat for lizards and other reptiles may bring unwelcome visitors. I know many gardeners who've had to deal with a snake or three at their place! Not my cup of tea, I can assure you — if anything makes me jump up on a high place and squeal, it's a snake!

Fluttering By: Insects

Do you see an insect and spray it or swat it? Do you view all flying or buzzing things as creepy-crawlies and not something you want around? Maybe you enjoy watching butterflies flutter about the garden on a sunny day with barely a thought to what they might actually be doing there. These guys are probably pretty busy foraging for food, mating, breeding and playing an important role in the life of your plants. Without some of these fabulous critters, your garden would be sadly lacking; actually, many of your garden plants would simply cease to exist. You've heard all about the birds and the bees — well it's not just the birds and the bees; other insects also play a major role in maintaining sometimes fragile ecosystems.

An enormous and varied range of insects exists in both Australia and New Zealand. Some have legs, some don't; some fly, some don't; some unfortunately may bite or sting you and some are completely harmless to you. Protecting and caring for native insects is just as important as it is to protect other more obvious native plants and animals.

Plants are *pollinated* — that is, the pollen is transferred from the male parts of a flower to the female parts so that fruit and seed can be produced — either by wind or by the activity of insects moving from flower to flower. Insects play a vital role in the pollination and reproduction of a huge range of plants. Without them pollination wouldn't happen.

These good guys can play a starring role in keeping your garden happy and healthy by:

- Eating the insects that damage your plants (predators)
- Laying their eggs inside or on other insects (parasites)
- Providing a source of food for birds
- Pollinating your plants

Bees

You may be tempted to duck for cover when you see a bee or a wasp, or swipe at a fly, but some species of these flying creatures are in your garden fighting the good fight for biodiversity and the health of your plants. And a lot of them, such as native bees, cause no harm to you whatsoever.

Australia has over 1,500 species of native bees, ranging from the blue-

banded bee to (my favourite name) teddy bear bees. They are valuable pollinators of native plants. New Zealand has 28 native bee species. Most are black or greenish, except a species in the South Island that is covered with dense orange and yellow hairs, and is often seen in summer covered in pollen from foraging among the flowers just like a honey bee.

Honey bees were introduced to both Australia and New Zealand by the early European settlers to supply them with honey and, like many introduced species, quickly became naturalised. Unlike some introduced species, however, honey bees have become important to the economies of both countries, pollinating food crops and producing honey, bees' wax, royal jelly and other products.

Populations of honey bees in the Northern Hemisphere have been devastated by a mite that moves into the hives and feeds on the bee larvae, killing millions. Honey bees from New Zealand are now in huge demand to replace those lost, particularly in Canada, where the mite has been particularly ruthless. According to the New Zealand National Bee Keepers Association, about 30,000 kilograms of live bees are being exported each year and more are desperately needed. Without the honey bee, billions of dollars of horticultural and agricultural production would be lost each year. Not to mention the food shortages that would result. The humble honey bee is one of the most important players in worldwide food production and needs looking after.

Butterflies

New Zealand has about 20 species of butterfly, although researchers reckon that number could be as high as 70 by the time they've finished identifying them all. Around 400 species are native to Australia, with quite a few being common to both countries. One of the major threats to the biodiversity of butterflies is clearing of their habitat, particularly for housing developments, and telecommunications towers. The towers can cause problems for the butterflies as they like to do something called *hilltop*, where, for reasons known only to them, they congregate on the tops of bare hills to mate and generally hang out. The towers stop them from hilltopping, which can affect their breeding cycles.

Native butterflies not only add movement and beauty, but also play an important role in pollinating a whole range of plants, both native and exotic, so attracting them to your sustainable garden is a good idea.

Butterflies are out and about during daylight, and quite like simple daisy-type flowers, which are easy for them to land and feast on. Some good butterfly plants, depending on where you live, are:

- Boobialla (*Myoporum* species)
- Rock daisy (*Brachyscome* species)
- Tussock grass (*Poa* species)
- Any local wildflowers that are high in nectar

To get butterflies to set up home at your place, you need to provide things they need, such as:

- **A good mix of plants.** Native grasses and daisies provide food and shelter to accommodate their life cycle. Flower shape is important, simple daisy-type flowers and small tubular flowers are best. Make sure you have some pale-coloured flowers, which they're attracted to.
- **Some rocks.** Butterflies like to bask and mate on rocks in the sun.
- **Plants with smooth foliage.** These are good for them to lay their eggs on. They need to lay eggs on the right sort of foliage so that the caterpillars have something good to eat and can then make their cocoons.
- **Access to water.** You can use a small birdbath or shallow saucer.

By providing the right habitat, you can enjoy the delight and benefits of butterflies in your sustainable garden no matter where you live.

Spotting the difference: Butterfly or moth?

The easy way to tell the difference between a butterfly and a moth is that butterflies are active during the day and moths come out at night. When they rest, butterflies hold their wings erect and moths hold theirs flat. Butterflies have clubbed antenna and tend to be brightly coloured, whereas moths tend to be duller and have feathery antenna. Of course, exceptions always exist in nature. In New Zealand, quite a few moths fly during the day, and the black mountain ringlet butterfly holds its wings flat at rest.

Other beneficial flyers

Nature is a wonderful thing — for every insect pest, some kind of natural predator exists. By getting to know the beneficial flyers around your place you can use the natural food chain to your advantage. Not only do you create natural pest control and minimise or eliminate altogether your use of chemicals, you also help to protect and preserve the biodiversity of insects.

Some of the good guys include tachinid flies, hover flies, most ladybirds and their larvae, lacewings, ground beetles and parasitic wasps. See Chapter 8 for more on these wonder bugs and what they can do for your sustainable garden.

Some plants are great 'lures' to get the good guys to move into your garden. You need plants that not only feed them, but give them shelter, and perhaps even somewhere to mate and lay their eggs. Parsley, coriander, mint and caraway are all good lure plants, as are most plants with daisy-like flowers and plants that are native to your area, as they attract native insects, bugs and butterflies.

A great way to get these lure plants into your sustainable garden is by creating an *insectary*, basically a plot as big or as small as you like with at least seven different plant species. Make sure you have plants of different heights — some groundcovers for the beetles and some shady protected spots for the lacewings to lay their eggs. You can plant your insectary in a sunny corner or it could even be a selection of pots of different heights and sizes on a balcony or a deck. You need to get to know your local insects, and make sure the plants you grow provide year-round food and habitat for them.

Here are some good plants for your insectary and what they attract:

- Amaranthus is ground beetle heaven.
- Coriander flowers are irresistible to tachinid flies and all types of bees.
- Cosmos attracts hover flies, parasitic wasps and lacewings.
- Dill attracts ladybirds, lacewings and beneficial wasps.

- Lemon balm is a favourite of parasitic wasps and tachinid flies.
- Parsley, all parts of the plant, is attractive to tachinid flies, parasitic wasps and hover flies.
- Tansy is great for bringing ladybirds and lacewings to your place.
- Yarrow is great for attracting predatory wasps, hover flies and ladybirds, and has the added bonus of enriching your soil and encouraging worms and other microorganisms.

Chapter 8

Keeping Plants Healthy

In This Chapter

- Getting to know your pests
- Diagnosing and treating plant problems
- Looking out for other plant issues
- Befriending companion plants

Growing a sustainable garden is a great way to do things the natural way. You can sit back and enjoy your garden, nature in perfect balance. What bliss! In an ideal world, your plants would always be lush, healthy and productive, with not a nasty bug or crippling disease in sight.

Well, perhaps you've noticed that I don't think this is an ideal world and, no matter how careful you are, there will be times when your plants are simply sick.

In this chapter, I put on my doctor's white coat and stethoscope and take you on a journey through some of the health problems you may encounter in your sustainable garden. You not only learn about bugs, insects and diseases, but other conditions that may harm your precious plants and stop them from thriving as well.

I let you in on the secrets of companion planting, handed down through the ages, some say by witches and fairies. Then I look into some natural remedies to keep your garden fit and well so you can throw away those nasty chemicals.

Those Pesky Pests

What is a pest? Most people think of pests in the garden as bugs or caterpillars that feast on the leaves of your precious plants, leaving nothing but the stalks behind, or perhaps what springs to mind are fat

juicy rosebuds covered in fat juicy aphids. But pests can also be larger beasts, such as possums and fruit bats, or microscopic bacteria and fungi that cause plant diseases. And not all bugs are bad for your plants — some of them actually help out by feeding on the nasties.

What makes something a pest?

A creature, whether it be bug, bird or beast, becomes a pest only when it begins to have a negative or even a detrimental effect on your sustainable garden.

Unless you're a market gardener, you can probably afford to lose two or three cabbages to some bug. Home gardeners generally produce way more vegies than they can actually eat and generally proudly give the surplus away to grateful friends and family. However, no-one likes to see their gorgeous rosebuds chewed by something. But how do you remedy the situation? What do you actually look for? If you're talking about bugs, for example, which are the good ones you want to keep and which are the blighters you want to exterminate?

As a sustainable gardener, you must decide how much pest infestation or disease is too much. A few spots on your leaves or blemishes on your apples may not matter to you. However, if you wander into the garden after rain and find the snails have completely eaten your newly planted lettuce seedlings, you need to take action. Some plants can have up to a third of their leaves chewed by insects and still keep going, although they may look unattractive. Some people expect the possums or the parrots to eat a certain percentage of their fruit crop every year and plan accordingly. To them, it's worth forgoing a small amount of food in order to have these little visitors in their backyards. Unless you are a New Zealander, of course, where possums are introduced vermin.

A sustainable gardener gets to know how their plants grow and what their plants need to stay strong and healthy. The best way to learn is by looking. Before you reach for the big guns, look at the problems, whether it be pest or disease. It may be that your plants have become a food source for hungry bugs, which in turn feed the hungry birds and other critters in your garden. As long as your plants are surviving being dinner, you could happily leave them alone. Becoming a sustainable gardener and managing pests and diseases sustainably makes you slow down and observe the life cycles and seasonal changes of your garden.

In order to decide how much damage is too much, you need to know what the pest or disease is. Is it common to your region or is it a new introduced nasty? Because you observe the changes and comings and goings in your sustainable garden, you get to know the critters that visit or make their home in it and start to understand their life cycles. A new pest or disease could be cause for alarm.

The changing climate could start to change the habits, life cycles and distribution of some of the more common pests and diseases, and even help introduce new ones. Research has already started on this problem in the agricultural and horticultural crop industries. It's been identified that even a slight change in climate can create opportunities for pests and diseases to invade and colonise areas they've never been seen in before. How and exactly what problems may occur is still being researched by the scientists. As a sustainable gardener, you can play a part by being vigilant to the emergence of any new and unusual plant problems at your place.

In Australia you can find excellent information on the federal government's National Pest and Disease Outbreak website at www.outbreak.gov.au. Biosecurity New Zealand also has comprehensive information on plant pests and diseases. Check out the website at www.biosecurity.govt.nz.

If you've found something you think needs to be reported, call Biosecurity New Zealand on 008 809 966, or in Australia phone the Exotic Plant Pest Hotline on 1800 084 811.

Common pests you should be aware of in your sustainable garden include:

- **Aphids:** Small sap-sucking insects that can also spread plant viruses.
- **Beetles (many different kinds):** Eat plant roots, leaves, flowers or fruit.
- **Budworms:** Burrow into and damage flower buds.
- **Cabbage white butterflies:** In caterpillar form, eat the leaves, especially, of cabbage and broccoli.
- **Mealy bugs:** Tiny sap-sucking insects.

- **Nematodes:** Parasitic worms that can feed on plant roots.
- **Pear and cherry slugs:** Slimy slugs that strip the leaves of pear and cherry trees.
- **Scale:** Sap-sucking insects that also cause the disease sooty mould.
- **Two-spotted mites:** Nasty critters that suck sap from plants, particularly in hot, dry weather.
- **Weevils:** Some roll up plant leaves, stopping them getting enough light to grow; others bore into the trunks and stems, and others eat new shoots.

Yep, a whole army of them is out there but, with a little bit of knowledge, not only will you win the battle, you will win the war and be glorious in victory. However, you first need to work out which are the goodies and which are the baddies. Some are good guys that are beneficial to your garden — some of the nematodes, mites and beetles in particular. For a great resource to work out which is which, check out *Backyard Insects* by Paul Horne and Denis Crawford.

Understanding a bit about the life cycles and habits of particular pests will help you to work out the best way to control them and when. It's all about understanding cycles and breaking them. Part of managing your sustainable garden is knowing your plants, your soil, your climate and the pests and diseases that might show up. If you know what conditions favour particular problems, you should be able to pre-empt the problems and stop them before they get out of control.

Plants get diseases too

Just as you and I get sick sometimes, your plants can also get diseases and viruses. To identify a disease in your plants, you need to get to know them and what they're supposed to be doing. By understanding your plants and spending time with them, you'll know what they're supposed to look like and be able to tell quickly when something is not quite right. You also need to know what sort of diseases may affect the plants in your sustainable garden and when those diseases may be a problem.

Diseases in plants are sometimes caused by viruses, bacteria or nematodes, but most often they are caused by fungi. These *pathogens* (disease-causing elements) are spread by people, birds and animals,

the soil, wind, water or even insects:

- Pathogens, or infected plant material or soil, can be carried on shoes, tools or machinery, and by birds and animals.
- Infected soil is easily transported on bulbs, tubers, cuttings or seeds, as well as by animals or people.
- Wind can carry fungal spores from infected plants long distances or simply to the plant next door.
- Water running along creeks, irrigation channels or over the ground can also carry infected material. Even rain or sprinklers can carry plant pathogens far and wide.
- Insects, particularly the sap-suckers, can carry various diseases in their mouths from plant to plant.

To control any plant pathogen you need to do a bit of research. Find out the life cycle, what hosts it needs, how long it can survive without its host and where it might survive. Basically, if you understand the 'disease triangle' that is the host, life cycle and environmental conditions favouring the pathogen, you can break the triangle and break the cycle.

What's that sooty stuff?

Have you ever seen a plant covered in black sooty stuff that looks a bit like the plant's been stoking the engines of a steam train? The soot can get so thick, you can't tell if the leaves are actually green rather than jet black. That's a plant fungal disease called sooty mould. It's not uncommon to see lemon trees covered in the stuff. If left, it can muck up the physiology of the plant, which can get very stressed and sick, and possibly even die.

What causes it? Well, it all starts with a little sap-sucking insect, called scale, that secrete a sweet, sticky honey-dew substance. When this sticky stuff is exposed to the air, sooty mould forms on top of it. Ants, known for their love of all things sweet, run along the plant collecting honey-dew and spreading it about with their feet. The more it spreads, the more sooty mould grows, the more the scale thrive, and so the cycle goes on.

So what can you do? The culprits that start this whole thing are the scale, and white oil, which is a petroleum oil that you can buy ready to use or in a concentrated form that you mix yourself, is a good treatment for them. Always follow the directions on the bottle before using. Kill the scale, and the rest of the problems will soon disappear. The ants will wander off in search of other tasty treats and the sooty mould will eventually decay and die naturally. If you want to speed up the process and rid your plants of the unsightly sooty mould, a bit of

unscented liquid soap or detergent and water in a spray bottle should do the trick.

You can make your own white oil at home. Mix two cups of vegetable oil and half a cup of dishwashing liquid in your blender. Store it in a clean jar. When you need to use it, dilute one tablespoon of your oil mixture with a litre of water, mix it well, and then spray it onto the affected plant. Make sure you cover both sides of the leaves and get the trunk and stems nice and wet with it. Never use this preparation on soft-leafed plants such as ferns or hairy-leafed plants like lamb's ears. It will seriously burn the leaves and your plants might even die. Also, make sure you don't spray in hot weather as the same burning problem is likely to occur.

Common plant pathogens include:

- **Apple scab or pear scab:** An unsightly, hard, large black or brown spot usually on the fruit, caused by a fungus.
- **Armillaria root rot:** A native Australian fungus that causes roots to rot and plants to then die.
- **Bacterial canker:** A nasty bacteria that commonly affects stonefruit (apricots, peaches and so on) causing the whole tree to collapse and die.
- **Brown rot:** Another common stonefruit disease, this time a fungus forming a powdery mass of spores on the fruit, which turns brown and rots.
- **Collar rot:** A fungus that rots stems or trunks of plants at ground level.
- **Damping off:** A fungal disease that can turn just-grown seedlings into a mushy mess and kill them.
- **Downy mildew:** A group of fungal diseases common on a wide range of plants in times of high humidity.
- **Fire blight:** A serious bacterial disease that affects apples and pears, among other plant species (as yet, not found in Australia but occurs in New Zealand).
- **Mosaic virus:** A number of different forms affect many different plants; can be spread by sap-sucking insects or infected fruit, seed or other propagating material.
- **Peach leaf curl:** A fungus that causes the leaves of peaches or nectarines to get lumpy and puckered.

- **Powdery mildew:** A common fungal disease eventually covering the surface, such as the leaves, with a mass of fine white or grey spores.

- **Rose blackspot:** A fungal disease causing big round black spots on the leaves of roses.

Meeting the good guys

Not all bugs, insects and diseases are pests. Hundreds, maybe even thousands, cause absolutely no damage to food crops or your gardens. In fact, numerous critters are useful in your sustainable garden.

Here are some of the good guys and how they keep some of the bad guys at bay:

- **Ground beetles:** You should encourage these useful little beetles to your sustainable garden. They love to forage under the leaves of your low-growing or groundcover plants and feast on any slugs, small caterpillars and their eggs, snail and grasshopper eggs, grubs and even aphids in your garden.

- **Hover flies:** These are often mistaken for nasty stinging wasps, as they look a bit similar with their yellow and black bands. They feed on nectar and pollinate your plants as they move about from flower to flower. Their larvae are predators of critters like aphids, scale insects, thrips and caterpillars.

- **Lacewings:** These little insects, sometimes known as antlions, are common in most habitats in Australia and New Zealand. The larvae in particular find scale, aphids, mites and other soft-bodied insects an irresistible lunch treat — they suck out their insides. In more arid, sandy areas they make little pit traps and lie in wait for smaller insects to stumble in, and then they grab and eat them.

- **Ladybirds:** You get good ladybirds and not so good ladybirds. Some are native and some are introduced species in Australia and New Zealand. Some of the good ones feast on aphids, scale and mites; others make a meal of any mealy bug in sight. In fact, in 1891 these ladybirds were exported from Australia to the United

States and were credited with saving the Californian citrus industry from a mealy bug plague. Both the adult and larvae of the fungus-eating ladybirds can clean up your powdery mildew problem.

- Just watch out for the 28-spotted ladybird — this one's the villain. Both the larvae and adults feed on a large range of plants, but they find anything from the bean, potato and cabbage families particularly tasty.

- **Parasitic wasps:** These are really useful critters to have around, great for keeping pesky flies and whiteflies under control. They lay their eggs in the flies' larvae and, as the wasp babies hatch and grow, they actually eat the larvae. They also go for beetle and moth larvae.

- **Tachinid flies:** These guys are parasites, they lay their eggs in other insects and the larvae hatch as parasites. They attack mainly the larvae of moths and butterflies, or adult beetles, caterpillars, grasshoppers and stick insects.

These insects should be encouraged to make a home in your sustainable garden as they prey on and devour the nasty pests you want to deter. By creating a biodiverse balance of plants, animals and insects in your garden, you help to create a natural ecosystem and remove the need to reach for the chemicals to control any problems.

You can even buy some of these beneficial critters to help control problem pests in both Australia and New Zealand. A quick web search of beneficial insects should turn up a range of different suppliers.

One way to attract and keep some of these beneficial insects in your garden is to make yourself an *insectary*, simply a plot with seven or so different varieties of plants that attract the good guys. You can make a patch in the garden or use pots of different heights and sizes placed together. Aim to add plants with daisy-like flowers (tiny flowers are better than great big ones) and mints. Also remember that plants native to your area attract native insects, bugs and butterflies. Refer to Chapter 7 for more plants ideal for your insectary, such as cosmos, tansy and lemon balm.

If you're new to sustainable gardening and have used chemicals in the past, it may take a bit of time for the insectary to work. The populations of the good guys will build over time.

Call the Doctor, My Plants Are Sick

How do you know your plants are sick? What are the symptoms? To make a diagnosis on what ails your plants, the first thing you need to know is what that particular plant is supposed to look like when it's healthy. How is it supposed to grow? Where is it happiest?

Once I was asked to look at some mature silver birch trees in an old garden with very new owners. I'd received a panicked call from a gentleman quite late one Sunday night. 'Help, my birch trees are dying! The leaves are yellowing, dying and dropping off. Some of the trees actually have no leaves at all and I think they're beyond help and already dead. Can you come over first thing tomorrow?' Now, I could have driven the considerable distance to his property the next morning to inspect the trees and make a diagnosis. But I didn't. I very gently explained to the poor chap that, as it was late autumn in south-eastern Australia, and, as his silver birch trees were deciduous, it was perfectly natural for the leaves to yellow and drop off. In early spring they'd be busting with new lush green leaves again.

By understanding your plants and your garden, you'll find it easier to diagnose problems. Table 8-1 provides a checklist to help you with this, or compile information to give to your plant doctor.

Table 8-1 Diagnosis Checklist

Ask Yourself.....	Why It's Useful
What's the name of the plant?	Knowing the name of the plant will help if you need professional advice.
How old is it?	Approximate age, if you can't be exact.
Where is it planted?	Aspect, soil type, drainage, mulch, fertilizer?
What's the problem?	Which leaves, stems, bark, flowers or roots?
How widespread is it?	All over, only on the top, only on the tips of the leaves or on the plants next to the infected plant as well?

When did you notice it? Did it occur after rain, in a time of high humidity or when the plant flowered, for example? Did the same thing happen last year?

What does the plant look like? Look closely and describe the damage or problem as best as you can. Are there spots, blotches or bits chewed off? Can you see holes, actual critters, webs or sawdust? Are the leaves an odd colour?

What parts of the plant are affected? Look for critters hiding on the underside of leaves, lumps on the leaves or stem, splits in the bark or gum oozing from it, rotting wood around the base of the trunk, discolouration of the flowers, wilting, or holes in the buds.

Where is the plant growing? The climate where you live can be important, as well as whether the plant is in sun or shade.

Any changes lately? Have you or neighbours had a new path built, or the folks next door have built an extension, for example. These things could be important.

What's the soil type and drainage? Is it well drained or is there water staying on the ground?

Has there been recently extreme weather? Such as a heatwave, hail, snow, frost or wind.

What's your water supply and do you know the pH level, for example?

What type of mulch or fertiliser have you used and how often? If you've recently completed a spraying program, what was it, when and how did you conduct it?

After you've diagnosed the problem, you need to work out how to treat it. There are three main methods of pest and disease control — chemical, cultural and biological — or you can use a combined approach. In this section, I also give you some recipes for natural remedies.

Controlling with chemicals

Chemical control relies on, well, chemicals to treat any pest or disease problems you may encounter. Reliance on chemicals is not recommended for the sustainable gardener. By relying on chemicals, you could be destroying the beneficial insects as well as the pests. Chemicals can end up contaminating your soil, killing or driving away the healthy organisms that live in it, damaging its structure and leaching into waterways and the water table. In addition, populations of pests can build up resistance to chemicals so that, in a very short time, you have super-resistant creatures and have to then use more chemicals — or more-lethal chemicals — to control them.

Government research has indicated that householders in Australia use up to 20 times more pesticides and fertilisers than farmers do, inadvertently posing a significant threat to plant and animal life. Using sprays may kill the bugs, and fertiliser will make your gardens and lawns lush and beautiful, but you really need to stop and think about

where all this stuff may be ending up. All sorts of problems in rivers and waterways can be traced back to the misuse of these products. Gardeners can sometimes be guilty of using that bit extra to make sure it works — feed your lawn to within an inch of its life and see all the excess run down the stormwater drain (and then wonder why the local waterway has a toxic algal bloom).

Think before you reach for the spray! If you must use chemicals, make sure you use the right one in the right amount for the problem you have with your plants. Always read the label and always use as directed.

Controlling through culture

Cultural control is when you use a range of physical methods to ensure you're providing the cultural requirements of your plants. Here are some examples of cultural control you could employ:

- Improving the movement of air around your plants, such as by pruning and 'opening up' the plants, makes them less susceptible to fungal disease.
- Cultivating the soil by digging it over exposes any insect larvae and pupae, which the birds will soon clean up for you.
- Taking out diseased or bug-infested plants as soon as they show any signs of a problem, called *roguing*, can nip a problem in the bud, so to speak. Make sure you dispose of infected material safely so that your plants can't be reinfected. You can put them in a plastic bag in the sun for a week to kill off any harmful organisms, and then compost them.
- Pruning is a good way to remove, dead, diseased or infested parts of plants. Again, make sure you dispose of the bits you take off properly. If it's a virus you're pruning off, make sure you sterilise any tools you've used after working on any particular plant to avoid cross-contamination. A simple weak solution of one part bleach to ten parts water does the trick. You can put it in a spray bottle and give your tools a thorough squirt between plants.
- Installing barriers is a good method of controlling unwanted pests, particularly from your fruit crops. Nets can be used to keep away

birds, bats, possums and other invaders. Snails hate getting their 'foot' dirty, so sprinkle shell grit, crushed eggshells, sawdust or hair around your seedlings.

Banding a tree with grease, cardboard or even aluminium foil can stop, or at least slow down, insects or grubs that may climb up the trunk. This method is often used to deter coddling moth from apple trees.

Trapping pests is a good solution in some situations. You can fill old flower pots with screwed up newspaper and straw to catch earwigs. If slaters and wireworms are a problem, scoop out some raw spuds and leave them upside down in the garden, and the critters will crawl into them, making it easy for you to get 'em. Pheromones are chemicals insects produce to communicate with each other. You can buy sticky traps containing certain pheromones to trick insects into being caught. A half a cup of beer in a jar half-buried in the ground is a great way to catch snails and slugs — they can't resist a beer and crawl in and drown.

Solarisation can kill weeds, their seeds and a whole lot of diseases and larvae. Lay a bit of plastic over the weeds or soil in warm weather, weigh it down with a few bricks, rocks or whatever you have and leave it for a couple of weeks. In summer, the temperature should get to about 50 degrees Celsius and that should kill most nasties.

Controlling biologically

Biological control is a method of keeping a pest, disease or even a weed at a level that you are able to tolerate by encouraging other living organisms to attack it. Lots of research is going on in both Australia and New Zealand in this field of pest, disease and weed control. Some methods you can use in your sustainable garden are:

Buy some ducks to eat your snails and slugs. I've heard of this method being recommended by a Buddhist teacher when discussing not harming living creatures in order to keep your karma clean. A perplexed student had asked, 'What do I do about the snails and slugs in my garden?' When the teacher said she should use ducks, the student replied, 'So the ducks are stuffed then!'

- **Encourage parasitic wasps to clean up your woolly aphid problem.** The wasp lays its eggs in the aphid's body. When the wasp eggs pupate, they feed off the aphid.

- **Use predatory mites to control two-spotted mites.** If you have a huge rose garden riddled with two-spotted mites, check with your local agricultural authority to see if you can buy some predatory mites to control them.

- **Use *Bacillus thuringiensis*, known as *Bt*, to control insect larvae.** *Bt* is a naturally occurring bacteria used to kill more than 150 species of insect larvae. Basically, when a caterpillar eats a leaf sprayed with *Bt*, its gut and mouthparts become paralysed. It can't eat and dies in two to five days. It's not toxic to other insects, fish, mammals, honey bees or other larvae predators and has no *withholding period*, meaning you can harvest and eat food that has been sprayed with *Bt* immediately, so it's safe to use on food crops. In Australia it is approved for use in organic growing (see Chapter 15 for information on organic gardening).

Using an integrated approach

Practising a combination of these methods is a good idea in your sustainable garden. Using cultural and biological controls, along with limited chemical control, in addition to choosing plant varieties resistant to particular problems, is called *integrated pest management*, or IPM.

Not relying on a single solution but using a range of measures gives you a good chance at achieving maximum success, and should reduce your need for pesticides. That's got to be a good thing. All sustainable gardens will have a few undesirables; you just need to decide your tolerance level and learn to live with a few bugs.

Trying some natural remedies

Most people want fewer chemicals in their lives. If you try to reduce your use of chemicals inside the house, why use them outside? To be a sustainable gardener is to be a chemical-free gardener as much as possible.

If you must spray with chemicals, be very careful and only spray what you need to spray — don't just fling it about everywhere. Make sure no runoff gets into waterways or ponds, don't let pets or your kids near it, read the label and follow the instructions to the letter. The less toxic stuff used on our gardens the better.

Instead of nasty sprays, you could try alternative methods. Here are some you can make up yourself.

Cabbage white butterfly

To stop these guys laying their eggs on your seedlings, scatter eggshell halves around. The butterflies are territorial (and perhaps have poor vision) and mistake the shells for other cabbage white butterflies and go away.

Aphids and mites

100 grams of chopped garlic bulbs

2 teaspoons of vegetable oil

2 teaspoons of liquid detergent

500 millilitres of water

Soak the garlic in the oil for at least 24 hours, then mix the detergent with the water and add to the garlic mix. Stir well and then strain into a glass jar with a lid. Make sure you label it as an insecticide and put it in the fridge overnight. To make up the spray, dilute 5 millilitres of the mixture in 1 litre of water. Put in a spray bottle and spray it directly onto the aphids or mites.

Blackspot on roses

1 litre of skim milk

1 litre of soapy water

Mix together and spray onto the leaves every couple of weeks.

Powdery mildew

4 teaspoons of bicarbonate of soda

50 millilitres of white oil (see the sidebar 'What's that sooty stuff?')

4 litres of water

Mix all of this together and spray on leaves as required.

You can also spray full-cream milk onto the affected leaves to kill this fungus.

Even though these are natural preparations, always take care when you're making, spraying and storing these mixtures. These preparations are intended to have minimal impact on our environment, but they are intended to kill. Anything meant to kill should never be regarded as safe.

It's Not a Bug or a Disease, So What Is It?

Sometimes you can spend endless hours trying to find the pest or disease that's causing a plant to look sick, only to find that's not the problem at all. You have to remember that, to be healthy and grow to their full potential, plants need the right temperature, the correct soil type, the right amounts of water and sunlight, air and food.

When trying to diagnose a plant problem, you also need to know what the plant is supposed to look like. Are the leaves meant to be yellow and mottled rather than a nice bright green? You also need to know what sort of conditions that particular plant is happiest growing in. Knowing these things helps you determine what's wrong with your plant.

If the plant's not under attack from a pest or disease, the problem could be something to do with its environment. Here are some things that may be affecting your plant:

- **Temperature:** Some plants love the heat and can't tolerate frost, for example; others, such as some fruit trees, need a certain chill factor in order to produce fruit (see Chapter 12 for more on fruit

trees). Make sure your plants suit your climate.

- **Soil type:** Soil gives plants nutrients but not all plants like the same types of nutrients, or in the same proportions. Some like an alkaline soil, others prefer acid (refer to Chapter 2 for information on soil pH and nutrients). And soil type also affects its drainage ability and therefore how much water the plant gets.

- **Water:** Again, not all plants need the same amount of water. Some actually grow in water, whereas others hate *wet feet* (having too much water and not enough drainage), and will develop root rot. See Chapter 11 for more on selecting climate-friendly plants.

- **Sunlight:** Not enough of it or too much — make sure your plant is getting the sun exposure it needs, whether it's full sun, total shade or dappled sunlight.

- **Air:** Yep, plants breathe — that's how they eat up carbon dioxide and produce oxygen. Thinning out a plant through pruning can actually help its condition by giving it more air.

- **Food:** Often plants need a boost to the nutrients provided by the soil and air around their leaves. Nutrient deficiencies can weaken your plants and make them susceptible to attack by whatever pest or disease is around. Make sure you provide adequate food for your plants, especially potplants (see Chapter 14), by adding fertilisers as needed.

To have a successful, happy and healthy sustainable garden, you need to make sure you put the right plant in the right spot. Understand the conditions required by the plants you want to grow and, if possible, provide those conditions. If it's impossible to provide the right conditions at your place, choose another plant to grow instead. Trying to change the conditions to suit a plant that just doesn't grow there has no real point.

Companion Planting

Companion planting, the practice of planting certain plants together, seems to hark back to the Dark Ages, when magic, fairytales and folklore were commonplace. It stems from ancient herbalists who

observed long ago that certain plants affected the soil and each other in certain ways. The effects could be good or bad, depending on the plant or the situation. Many herbs and bright-coloured flowers were believed to repel or attract certain insects, for example. Others were said to add nutrients to the soil that were useful to the next crop to be planted. That sounds like good old-fashioned crop rotation to me, where you follow one crop with another that will replace what the last crop took from the soil.

Some sceptics dismiss companion planting as old wives' tales or witches' spells. Here are some tales regaling the effects of some herbs that may seem just a little far-fetched:

- St John's wort protects against evil fairies and witches.
- You shouldn't plant foxgloves near your door, lest witches put the flowers onto their bony finger and pick your locks!
- Plant hemlock in the garden and you won't sleep at night for all the racket made by the witches and ghosts having a fine time making flying ointment and brewing all manner of concoctions in your backyard. (It is much quieter around my place since I dug the hemlock out!)

Maybe it's stories like these that make people dismiss companion planting as a bit whacky. But seriously folks, despite the science of companion planting being a bit light on, you could try a few of these practices in your sustainable garden. I reckon if you think it might work at your place, give it a go — it certainly can't hurt. If things don't seem to work as well as you thought they might, just remember, companion planting was developed in the Northern Hemisphere, and that seems to make a difference to those of us down under. Also remember, like people, some plants just don't get along.

Sustainable gardeners most often use companion planting methods in the food garden. Permaculture gardens employ a similar practice, known as *guild planting* (see Chapter 16).

Table 8-2 provides some examples to get you started, but you can find out lots more, including what some plants do for their neighbours at the Sustainable Gardening Australia website at www.sgaonline.org.au. Click on Info Pages and then select Plants to find the Companion Planting page.

Table 8-2 Companion Plants

Plant	**Companions**
Basil	Tomato
Beans, bush	Beetroot, cabbage, carrot, cauliflower, celery, coriander, cucumber, dill, French marigold, marjoram, mint, nasturtium, pea, potato, rosemary, sage, thyme, zinnia
Cabbage family	Chamomile, onion
Capsicum	Basil, cucumber, lettuce, peas
Carrot	Beans, lettuce, onion, radish, tomato
Cucumber	Beans, cabbage, corn, lettuce, peas, radish, sunflower
Eggplant	Beans, capsicum, potato
Garlic	Beetroot, cabbage, lettuce, strawberry
Lettuce	Beetroot, carrot, cucumber, onion, parsley, parsnip, peach, pear, raspberry, rose, rosemary
Onion	Beetroot, cabbage, lettuce, strawberry
Parsley	Asparagus, fruit trees, radish, zucchini
Pea	Asparagus, sweet corn, tomato
Potato	Beans, cabbage, corn, horseradish, marigold, peas, pumpkin
Pumpkin	Any good all-rounder
Tomato	Asparagus, basil, borage, cabbage, carrot, chamomile, chives, cress, cucumber, fennel, garlic, lettuce, onion, potato, rosemary, sage, thyme, wallflower, celery, chives, dill, French marigold, grape, marjoram, mint, nasturtium, onion, parsley, parsnip, turnip

The real secret to companion planting is that it encourages biodiversity. By creating a biodiverse garden with a mix of plants, both native and exotic, that provide flowers and a food source all year round, you provide a haven for the good guys. And they clean up the nasties for you, so you'll never have to reach for the chemicals again.

Remember, creating a monoculture at your place is an invitation to an 'all you can eat' feast for pests and diseases.

Chapter 9

Compost and Mulch

In This Chapter

- Understanding the benefits of compost
- Reducing your carbon footprint with compost
- Choosing a composting method to suit you
- Creating your compost
- Getting to grips with mulch

People go on about compost a bit, and it all sounds so complicated that you probably wonder if creating compost is worth the effort. Well, it is worth the effort, and a compost heap or bin is much, much more than just a place where you dump all your garden prunings, leaves, weeds and lawn clippings to sit and decompose, eventually. If you have one of those sorts of compost heaps, you probably wonder why on Earth nothing ever happens there.

In this chapter, I show you how to change all that. By adding some good fresh stuff like your kitchen waste and a touch of manure, as well as some long-dead material like unbleached paper and straw, layering them in the right proportions, you can add huge benefits to your garden.

The perfect compost heap is a hotbed of degeneration . . . mmmm. You should see what goes on in a 'true' compost heap — pretty hot stuff — those bugs, bacteria and microorganisms really know how to get down and dirty. Think you'd like compost like that in your sustainable garden? Well, read on!

I also give you the lowdown on mulch, that most basic mimicry of the natural gardens of the bush. Save water, improve your soil and keep your plants well protected with just the right type of mulch for your place.

Compost: What Is It Exactly?

You hear the word *compost* thrown around a lot, but what actually is compost? Composting is what you do with the organic matter you rake up and put in a pile. The end product, derived from the decomposition of organic materials (remembering that organic material is anything that was once living), is technically referred to as *humus*. It is this end product, the humus, in your compost heap that is the valuable product you're after. Humus looks very much like a rich, dark soil. It is *friable*, or crumbly in texture, and smells delightfully earthy. Hard to believe that a short while ago this was a pile of vegetable waste, grass clippings, leaves and so on.

The transformation has come about because of microorganisms and bacteria, the correct temperature and moisture levels, and the perfect carbon–nitrogen ratio. Oh dear, that last bit sounds complicated doesn't it? It isn't really. Think of the carbon component as the long-dead material, things like shredded newspaper, cardboard and straw. And the nitrogen component is anything green that was recently growing — weeds, grass clippings, leaves, prunings and kitchen scraps. Combining the two elements in roughly equal proportions gives you the right *carbon–nitrogen ratio*. I tell you more about this ratio in the section 'Getting Down to the Business of Composting' later in this chapter.

Spreading the word

Part of your job as a sustainable gardener is to be an 'educator'. Bet you never thought you could be a teacher, hey? But people will be so impressed with your sustainable garden they'll want to know how to do it. And after reading this book you'll be able to show them.

When you've been won over to composting and establishing a worm farm (see Chapter 10), your job is to educate three households — the one behind you and the two either side. How many houses in your street? If everyone in your street composted their waste, imagine the difference that would make to landfill. A domino effect would see an enormous reduction in waste going to landfill before you know it. Gardens busting out of their boundaries, and people saving heaps of money and having a minimal impact on the environment from living sustainably. It's up to you!

Dealing with Waste

Part of being a sustainable gardener and a person living sustainably is that you commit to minimising the amount of waste that leaves your property by dealing with it yourself. Your rubbish, your responsibility really. Don't just chuck it out and expect some other poor sod to have to sift through your detritus. That's a tough line isn't it?

I actually know a fellow employed by a waste management company, and each week he sorts through everyone's rubbish in their recycling bin, including mine. I don't like the thought of him having to handle my dirty yoghurt containers, pet food tins, milk cartons or jam jars. So now I rinse them, make sure they're clean and not smelly. I make sure I don't put unwanted plastic in the recycling bin, because it's a pain for him to pick out. Knowing someone who has to do this job has made a huge difference to how I deal with my waste. I guess I'm one of those people who could never pay someone to clean my house because I would clean up before they arrived!

Kaikoura greening the globe

New Zealand is a country committed to preserving its natural assets, and a little town called Kaikoura, on the east coast of the South Island, was the first community in New Zealand and only the second in the world to be Green Globe benchmarked. This means that the Kaikoura district is internationally recognised and accredited for its commitment to creating a more sustainable world through tourism and travel. The aim is to attract tourists while making sure that the tourist impact on the precious environment is minimal. Around 60 Green Globe districts are now dotted around New Zealand and there are 51 in Australia.

Not only was Kaikoura the first district in the country to ban plastic bags, it also introduced the LoveNZ public recycling bins. The council was the first to employ an environment officer and it is aiming for zero waste going into landfill by 2015. Residents don't expect to get their rubbish picked up every week, but they have their recyclables collected. They can leave out the usual recyclable stuff such as glass and plastic, as well as any green waste and even kitchen scraps that have been composted in the bokashi bucket that the council has supplied to every single household. (Check out 'Binning it' in the next section for more on these nifty compost bins.)

In March 2009, Kaikoura also held the inaugural Biodiversity Bonanza, a weekend

showcasing the unique biodiversity of the region. This wonderful place is way ahead of its time, promoting eco-conscious living long before it became trendy.

What a forward-thinking, sustainable community. Wouldn't it be great if that was the norm everywhere? Well done Kaikoura.

The kitchen waste and garden waste that goes into your compost helps to sustain your garden. You reduce your need to buy fertilisers, soil conditioners and garden mulches because your compost heap provides all of these things for you. The rich humus incorporated into your soil encourages nature to do its thing naturally. Earthworms and many other beneficial organisms thrive in these types of enriched soils, providing enormous benefit to your plants, not only in improved growth and productivity but also improved resistance to disease. The nasty bugs that damage your plants can detect a weakened specimen a mile away and have a field day decimating the poor thing.

Choosing Your Composting Method

The benefits of composting are easy to see when you get down to it. Getting started isn't all that hard either. But first you have to think about what type of composting method you need.

A number of options exist for composting, from hand-made timber constructions surrounding a compost heap to manufactured compost bins, which also come in a range of designs, shapes and sizes. What you need to do is identify the method that best suits your needs and your situation. If you want to build a compost heap through the biodynamic technique, which is quite different in preparation but delivers a very similar end product, check out Chapter 17.

Heaping it on

Compost heaps can be quite large and take up quite a bit of space so are usually best suited to the home gardener with a very big garden. The larger the garden, the more organic waste it generates for you, which in turn gives you more compost to use on the garden. In a large sustainable garden you'll have piles of leaves from deciduous trees, buckets and buckets of grass clippings, plenty of prunings and heaps

of weeds — whoops, no, no no. You don't have weeds in your sustainable garden do you?

Compost heaps can be constructed in a number of ways, using a variety of materials, such as timber slats, old wooden pallets or concrete blocks.

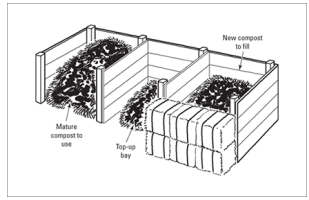
Make sure that the timber hasn't been treated with any nasty chemicals. The chemicals will leach into your compost and certainly kill off any friendly bacteria.

Many people subscribe to a two- or three-bay system, which allows a rotation between the bays. Figure 9-1 shows a three-bay compost heap constructed from planks of timber, with space between the slats for air flow. Each bay is about a metre square and a little under a metre high. Over a year you fill up one side of the enclosure and then allow it to rest over the following year, while you fill up the other side. By the time the second bay is filled up, the first is ready to use on your garden. The middle bay is used for excess organic materials to top up the bay you're currently filling, when needed. You can use straw or hay bales to form a temporary barricade — you won't want to use timber on the side you'll be shovelling from!

You can see why this system is great for a garden that generates lots of organic waste. Each bay of compost is at a different stage of decomposition. So the sustainable gardener always has a ready supply of humus available.

Single-bay compost heaps are useful in gardens that generate less organic waste.

Figure 9-1: In a three-bay compost system you use the mature compost from one side, while you fill up the other; the middle bay is for excess material to top up the new heap.



Binning it

If you have a smaller garden and generate smaller quantities of organic waste, a compost bin or barrel is probably more suited to your needs.

A huge variety of compost bins are available on the market. Some are very expensive and some are cheap and nasty. Some are designed to sit in your garden; others can sit on a slab next to your shed if you want. You can even buy a bin that sits comfortably in your kitchen.

Here are a few of the more commonly used bins that give you delicious compost without too much effort:

- **The upside-down bin.** This lightweight bin (see Figure 9-2) can be moved easily if you want to change its location. The bottom of the bin is open and is wider than the top, and sits on a level area of bare earth. The compost must be in contact with this bare earth to encourage worms to enter and work their magic on your organic waste. The narrower top of the bin always has a lid. The lid prevents unpleasant odours from escaping, and keeps out vermin and rain.

- **Tumble-type bins.** These bins — and you have a few styles to choose from — usually have a capacity of about 220 litres and are made of heavy-duty UV-resistant plastic mounted on galvanised steel stands — really just a big barrel on legs (see Figure 9-3). Just bung in your stuff to be composted (see the next section, 'Getting Down to the Business of Composting'), give it a spin every now and then, and in about six weeks it's done. These tumblers are good because they're enclosed, so no rats or mice can get in, and tumbling means you don't have to turn the compost yourself.

Figure 9-2: Commonly, compost bins look like an upside-down rubbish bin.

Recycled bins. A type of bin is manufactured in Australia that's made from 100 per cent recycled plastic. In fact, I'm told the manufacturer uses old $5 and $10 notes, but I don't think you can reconstitute the notes from the plastic. They're a good sturdy bin with a 225-litre capacity (see Figure 9-4). They're cheap, effective, easy to put together and provide sweet-smelling compost in about eight weeks, ready to use. The holes in the sides let air in to help with the decomposition. With these bins, you simply fill them and then leave the stuff to break down, as this bin sits on the soil. When your compost is done, you simply lift the bin off or undo the ties on the sides and peel the bin away from your pile of compost.

Figure 9-3: Tumble bins make the process of turning your compost simple.

Figure 9-4: Some compost bins are made from recycled plastic, doubling up on sustain-ability.

The bokashi method. This is a really nifty little way of making compost. *Bokashi* is a Japanese term that means 'fermented organic matter' and that's exactly what this little beauty gives you. It's a bucket with a lid and a tap at the bottom that sits on your kitchen bench or in the cupboard under the sink (see Figure

9-5). You put all your kitchen scraps — even meat, cheese and the things that don't normally go into the compost — into the bucket, add the activator and away you go.

The activator is a mix of bran and sawdust infused with beneficial microorganisms that start the fermentation process. Each time you add scraps you sprinkle about a tablespoon of the activator on top and let it ferment for about 10 to 14 days. If you get a bit of liquid in the bottom, that's what the tap is for. Just drain it off and use it on your plants (diluted with water) or pour it down the drain. Don't panic, doing this is not wasteful or harmful; in fact, it can help to clean up the waterways because it competes with the nasty bacteria in your pipes. The other material you end up with looks very different from more traditional compost, looking a bit like pickles. To use this stuff, you can dig a hole around your plants and bury it or put it into a traditional compost bin or pile. This stuff is really helpful in rejuvenating old, tired and very dry soil.

Figure 9-5: The bokashi bucket sits on your kitchen bench or under the sink to take all your food scraps.

Getting Down to the Business of Composting

After you've worked out the composting system that's right for your place, you need to start the process itself — not really a difficult thing to do. In this section, I lay down a few ground rules for what you can put into your compost (and what you can't). And then it's down to business. I give you a few simple instructions that will soon give you a working compost system producing a rich, earthy-smelling humus to improve your sustainable garden.

What goes in and what doesn't

First here's what you *can* put into your compost:

- **Paper and cardboard:** Shredded newspaper and office paper, and non-glossy packaging and cardboard are all fine to use.

- **Weeds:** Seems like a funny thing to add to the compost, doesn't it? However, an efficient compost heap has an internal temperature of 60 degrees Celsius, hot enough to kill off weed seeds, so they don't present any threat to your sustainable garden. Most plastic bins do heat up pretty efficiently, but make sure yours does heat up enough to kill the seeds.

- **Ash from your fireplace:** Wood ash and charcoal help with regulating the acidity of the compost. Don't use too much though. Once again, it's a matter of balance.

- **Lawn clippings:** Again, too much at once is not good. Chuck in half a dozen good handfuls of shredded newspaper, twigs, small sticks or sawdust every time you empty the catcher from the mower onto your compost. This assists with aeration through the mix. Remember, it's about balance.

- **Tea, teabags and coffee grounds:** I'm amazed by the amount of coffee grounds composted at my place!

- **Eggshells:** You need to crush them first to help them break down quickly.

- **Kitchen scraps:** Avoid large chunks, which take longer to break down, and keep citrus and onion to a minimum (see the next list for what not to use in your compost).

- **Leaves and prunings:** Don't put in any branches larger than a centimetre in diameter.

- **Manure:** Horse, sheep, goat, cow or chicken manure is fine.

Some things *not* to put into your compost are:

- **Cat, dog or human poo:** Some specialised systems can deal with human and pet poo, but it must be treated with care because parasites and worms can remain active in the pile. If composting human and animal waste is something you're really keen to do, it must be composted separately and not used on edible crops.

- **Meat, meat products or bones:** Unless you're using a bokashi system, meat products shouldn't be used as they attract vermin to your yard, including rats, mice and stray cats.
- **Too**
- **much citrus or onion:** More than a dozen or so peelings or scraps of each a week will make the compost very acidic and kill off the friendly bacteria.
- **Anything that has been treated with chemicals:** This includes sawdust from treated timber, and glossy packaging material, magazines, brochures and leaflets.
- **Large branches and sticks, or big pieces of vegetable scraps:** These will only slow down the composting process. The smaller the organic matter, the faster it will produce humus and the happier you'll be.

Throwing worms into your compost is not a good thing — they keel over. If you have a bin that's open at the bottom they soon make their home there.

Starting your compost and using it

Building a healthy compost is about layering the different materials in the right proportion in order to get your organic matter decomposing in the correct manner.

Here's how to build your compost:

1. **A drainage layer:** The first layer of organic matter in your compost is in contact with the ground (unless you're using a tumble bin) so it needs to allow good drainage and be a reasonable thickness. A 10-centimetre layer of dry leaves, sugar cane mulch, pea straw or something similar does the trick.

2. **Active compost:** Some beneficial bacteria from elsewhere is useful as it gets things off to a quick start. You can purchase active compost from nursery centres, or a neighbour with a good healthy compost may be willing to donate a shovelful. Mix this in with the first layer of leaves or sugar cane mulch.

3. **The good stuff:** Begin adding other materials, such as lawn

clippings, prunings, kitchen scraps and manure (nitrogen-producing waste) and dry leaves, newspaper, cardboard and straw (carbon-producing materials) in 5- to 10-centimetre layers, or you can premix some of the materials and then add them to the compost. When you're layering you don't need to turn the compost. Using the right proportion of nitrogen- and carbon-producing elements is important to get the compost working efficiently, so next I give you some recipes that achieve that mix. Focus on layering in the right proportion, just like making lasagne!

Here are some recipes for mixing compost ingredients that may be useful (shredded newspaper or cardboard can replace dry leaves but in about half the quantity):

- Mix or layer alternately two parts loose dry leaves, or one part shredded newspaper or cardboard, with three parts lawn clippings.
- Mix or layer two parts grass, two parts leaves and one part vegie waste from your kitchen.
- Mix or layer 2 to 3 centimetres of fresh manure with 5 to 10 centimetres of a dryer component like dry leaves to absorb the high moisture content.
- Mix or layer equal amounts of fresh leaves, lawn clippings, dry leaves and kitchen waste in 5- to 10-centimetre layers. Manure can be added in smaller amounts of 2 to 3 centimetres.

Vegie scraps and other kitchen waste is usually pretty wet, so don't overdo it with the kitchen waste. If your compost is too wet, the healthy organisms won't be able to breathe. When I say don't overdo it, I mean make sure you add plenty of dry materials as well, about twice as much.

A compost bin with a capacity of 8 cubic metres will convert that amount of waste into 0.35 cubic metres of humus over a 10- to 12-week period. How much you actually need in your sustainable garden is dependent on how you want to use it.

Good finished compost has a multitude of uses in your sustainable garden. For example, it can be spread over and dug into a new vegie patch; it can be spread around the dripline of vegies or garden plants to a depth of 3 or 4 centimetres; it can be added to coarse sand and

used as a seed-raising or potting mix (see Chapter 14 for more on potting mixes). That's why successful sustainable gardeners call it 'black gold'.

Avoiding slimy, stinky compost and other issues

Having created a slimy stinky compost on more than one occasion, I can tell you that they are quite revolting things to deal with. Usually, if my compost is too wet, it's because of vegie and kitchen scraps that I've chucked in and forgotten to top up with a layer of dried leaves or straw, or even shredded paper.

What happens some time later, maybe weeks later, is that I have to deal with it. This usually means trying to mix it up a bit with a fork and then add some dry matter, and I can tell you that's easier said than done. Prevention is better than cure.

Here's some advice that I should heed myself.

Too much and too wet

Composting is much faster if you break up the materials you add so they're not too thick or large. The little microorganisms and bacteria are much quicker at munching through smaller particles.

Remember also that microorganisms, good bacteria and even worms (see Chapter 10 for more on worms) will drown if the mix is too wet. The compost will become what is technically called *anaerobic* (that is, lacking in oxygen) and will be cool, acidic and smelly. In fact, the gases given off by an anaerobic compost are the same as the gases that contribute to the greenhouse problem and global warming. That is definitely not sustainable.

Too dry

If the conditions in the compost are too dry, the bacteria will become dehydrated and die off. Surprisingly, it's very difficult to evenly wet a compost heap after completing the layering. The surface often becomes water-repellent (*hydrophobic*) and the water just runs off.

To assist with moisture retention in your compost heap try adding dry horse manure during the layering process. It has huge water-holding capacity, almost like a sponge, and helps to retain moisture.

You can also make spike holes in the compost with large rods. The holes will assist with water absorption and aeration. Inserting thin perforated hollow plastic pipes into the heap further assists the process.

A little helper

You can assist the breakdown of organic matter in your compost by adding an activator. Here are a few additions that can make a difference to the quality of your compost:

- Five or six torn-up comfrey or yarrow leaves every two to three weeks.
- A small handful of garden lime, occasionally. Do this after four or five weeks, particularly if nothing seems to be happening in the heap and things aren't breaking down. You should notice a rapid change.
- A spadeful of chicken, cow, horse or sheep manure added once or twice over the composting time is also helpful. But remember, manures are a precious resource on their own because they can be made into teas and used as a liquid fertiliser. Horse and sheep manure are valuable soil conditioners that can be added directly to the soil to improve structure and retain moisture in the soil.

Ensure that you turn your compost over as best you can to assist with incorporating the activator through the heap.

And remember, you need a nice balance of carbon and nitrogen to make it all work. A simple way to remember what's what and which is which is:

- Carbon is dead stuff
- Nitrogen is living stuff

Or think of carbon as brown — autumn leaves, hay, straw, newspaper, cardboard and so on — and nitrogen as green — fresh manure, lawn clippings and kitchen scraps, for example. Use roughly equal amounts of brown and green. Your compost needs a bit of oxygen, a bit of moisture, a bit of warmth — get the balance right and your compost should also be right.

When is it cooked and how do you

serve it?

'Cooked?' you say. 'What d'ya mean, "cooked"?' Well, believe it or not, that mix of ingredients in your compost is actually cooking.

All of those materials combined with bacteria and the right weather conditions make that heap warm up to temperatures of over 60 degrees Celsius. So, in fact, it is cooking. Much the same as cooking, though, if it gets too hot, it will burn — not literally catch alight, but all of the good bacteria will burn and die off. So keep the heap adequately moist, particularly through the warmer months.

You know your compost is ready and turned into beautiful rich humus when it has a fine crumbly texture, a lovely dark brown soil colour and a delightful earthy smell. It won't contain any coarse or large particles of food waste, or large sticks (because you didn't put them in there). The ingredients that made up your compost originally will be unidentifiable — totally.

If you have a compost bin, it may have a door at the bottom. Simply open the little door and use your spade to scrape out the humus into a bucket or wheelbarrow ready for distribution over your sustainable garden. The stuff left in the bin will drop down and continue to decompose.

If your bin doesn't have a little door at the bottom, you can do one of two things, depending on how energetic you are and how dirty you want to get:

- You can lift the entire bin by about 10 to 20 centimetres off the ground and support it with a couple of bricks. Next use your spade to scrape out the humus. When you have removed all of the humus, simply lower the bin back down to ground level and the material in the bin will continue to decompose.

- The second method involves lifting the bin completely away from the compost so that everything in the bin, the decomposed and non-decomposed matter is exposed. Place the bin very close to the original spot and refill it with the non-decomposed matter. Keep doing this until you are left with the humus at the bottom.

Humus is more of a soil conditioner, rather than a fertiliser, so you won't overwhelm your plants with nutrients when you apply it.

However, remember that more is often not best. The soil does have a threshold and if you reach that threshold you'll simply be wasting the humus. A spadeful is ample and can be placed around your plants or vegies, or it can be dug into the earth. If you decide to incorporate it into the earth, be fairly gentle, because there are more than likely a number of worms living both in the soil and in your compost, and you know how much a worm hates a spade.

The compost cycle is fairly straightforward, really very flexible and can so easily be adapted to suit your specific needs and those of your sustainable garden. The key to your success with composting is monitoring the heap to ensure it is never too wet, or too dry.

Mulch and Reap the Benefits

Go for a wander through the bush or the forest or anywhere that plants are growing in their natural environment. Look closely — what do you see? Soil being constantly created and replenished by leaves, twigs, flowers, fruit, dead critters — in fact, all sorts of organic material. In most natural settings, the earth and the plants are being nurtured and protected by this wonderful stuff. It's natural mulch. To garden sustainably, you need to replicate this natural system to help create an environment your plants will thrive in.

You can conserve water and help the soil in your garden by understanding the benefits of mulch. Mulching properly can reduce the amount of water you need to use by up to 25 per cent! It also reduces the amount of water that evaporates from your soil and helps it retain precious moisture. One of the best things about mulch is that it suppresses weeds. Fewer weeds means less weeding for you and less competition for your plants. A win–win situation.

Mulch also helps to keep the soil temperature at an even level. Put your hand under your mulch on a hot day and the temperature of the soil will be cool. In the summer, mulch shades your soil from the heat of the sun and helps stop moisture from evaporating. The thing most plants hate is huge fluctuations of temperature around their root zone. Mulch helps to stop that and keep their precious roots at a nice even temperature. In winter, the temperature around your plants' roots is regulated by the mulch, so you have less frost damage. Sort

of like putting a blanket over the roots.

The best type of mulch is the mulch you get for free. The humus from your own homemade compost is a great mulch. You can use a chipper to break down all your tree prunings and other plant material for mulch or simply rake up leaves and prunings to surround your plants. Not only are you using all the green waste from your own yard, you're also reducing the need for mulch to be transported from who knows where, decreasing your carbon footprint.

If your garden is large, you may not be able to produce enough green waste to make enough mulch of your own. If that's the case, you need to get it from elsewhere. Some councils sell mulch they make from the green waste they collect or the trees they chip in their pruning program. Your local garden supply yard should also have a good range of mulch for sale, from seaweed to pine bark. Mulch can vary enormously in price and quality, so be sure to read this section before you go shopping, to get to know the right mulch for you.

Types of mulch

Mulch is basically divided into two types, organic and inorganic. *Organic* mulch was once something living. It breaks down over time, helping to improve the structure, nutrients and water-holding capacity of your soil as it does. *Inorganic* mulch was never living, and doesn't improve your soil, though it does help hold moisture. Some inorganic mulch can end up becoming hydrophobic, repelling water, or even compacted, which is no use at all.

Organic mulches include:

- **Bark:** A huge variety is available from a range of timber. Make sure if you're using bark mulch that it's not from timber harvested from old-growth forests. Only use bark mulch from plantation-grown timber.
- **Grape stalks:** I've seen these used on native gardens near wineries. It looks great and lets plenty of moisture into the soil.
- **Grass hay:** Good in an emergency, but you can end up with more weeds than you know what to do with.
- **Green manure crops:** These plants are grown to return nutrients to your soil. The best place for these in your sustainable garden is the vegie garden. You let them grow and then, usually while they're still green, you dig them into your soil. Common green

manure crops are peas, beans and comfrey.

- **Humus:** You can buy it in, but making your own from compost is best.

- **Leaf litter:** You could compost autumn leaves first, but it makes sense to leave your leaf litter where it falls in your sustainable garden — the plants provide their own mulch.

- **Lucerne hay:** Adds nitrogen to the soil, but can be expensive.

- **Manures:** Just make sure they're not too fresh. Horse manure is good as it adds some good structure to your soil and helps dry soils to hold moisture. In fact, I use this instead of peat at my place.

- **Mushroom compost:** This stuff is the spent growing media from mushroom farms, and contains straw, wheat, poultry litter and gypsum, which is then pasteurised to kill harmful bacteria. It's a valuable addition to your garden but don't use it on your acid-loving plants, such as azaleas and strawberries, as it tends to be a bit alkaline (refer to Chapter 2 for more on pH levels).

- **Pea straw:** Readily available in Australia, but in New Zealand you can only get pea straw easily in the South Island; you can get a pelletised form in the North Island. Pea straw added to garden and vegie beds adds a cottage garden effect; however, you need to be a little careful with pea straw. The peas contained in the pea straw add nitrogen to your garden — fantastic. However, when the pea plants start to grow and then flower, they actually use up soil nutrients to produce peas, leaving less nutrients for your vegies or other plants. Of course, the diligent sustainable gardener just picks out the little pea plants when they shoot.

- **Peat:** Coir peat from coconut husks, also known as coir fibre or coco peat, is a better sustainable resource than peatmoss, or bog peat. Coir peat is made from the waste products of the coconut industry. It's 100 per cent natural and biodegradable, and has just about the perfect pH for your plants at around 6 to 6.7 (refer to Chapter 2). It usually comes in compressed blocks, which you place in a bucket of water — fun to watch as the water is absorbed by the coir. When the coir has been rehydrated it can be spread around your plants where it continues to absorb moisture and conditions the soil.

- **Pine needles:** Great if you need to increase the acidity of your soil or if you grow azaleas and rhododendrons.

- **Pine strippings:** Can be a good cheap alternative for large areas. Most pine strippings or pine barks come in a variety of grades, ranging from coarser and larger particles down to smaller particles. Species used also vary, including cypress, hoop or plantation timber. The type you choose is really dependent on the effect you want and how much you want to spend. Aged or mature bark is recommended.

- **Seaweed:** If you live by the coast and it's legal to collect it, you can use seaweed on the garden. Some places now sell composted seaweed. Seaweed is actually a soil conditioner that can be used as a mulch. If you're fortunate to be able to collect your own seaweed, just place it around your plants. In order for it to be really effective, cover the seaweed with pea straw, or some other mulch. This assists with water retention and breakdown of the seaweed.

For peat's sake

Peat, also known as peatmoss or bog peat, is partially decayed organic matter that has formed over thousands of years and is then extracted from wetlands. In Australia, peat-forming wetlands are rare and very little peat is produced. Most of it is imported from New Zealand and various Northern Hemisphere countries. Extracting peat destroys specialised and unique habitats. These habitats often hold diverse and complex vegetation and rare fauna, ranging from mammals and reptiles to invertebrates. Peat deposits around the world are major carbon storage areas, and exposing this peat to oxygen is thought to be a major contributor to the increase in atmospheric carbon dioxide. The New South Wales branch of the National Trust of Australia is conducting a campaign to save Australia's rare peatlands.

Chunky mulch or fine mulch?

Most types of mulch are available in different particle sizes. Yates in Australia conducted a trial highlighting the differences between chunky and fine mulches. They tested 20 different mulches with different particle sizes for two main properties — their ability to reduce soil evaporation and their ability to soak up water and therefore stop it from getting to the soil.

The mulch was divided into four categories:

Chunky: 100 per cent of particles didn't fit through a 5-millimetre screen

Mostly chunky: 65 per cent of particles didn't fit through a 5-millimetre screen

Chunky and fine combination (half and half): All the fine particles fitted

through a 2-millimetre screen

Mostly fine: 65 per cent of particles could fit through a 2-millimetre screen

After rigorous testing, the results were quite interesting. The best by far for reducing evaporation and letting water into the soil was the chunky mulch. The worst was the mostly fine mulch, which soaked up more than four times the water the chunky mulches soaked up.

This means that a thick layer of fine mulch will soak up precious water and not much will get to your plant roots. Use chunky mulch for the best possible results.

- **Sheep dags:** Can be pelletised or fresh from the shearing shed. They contain a balance of nutrients beneficial to your plants and your soil's structure.

- **Sugar cane:** A great renewable resource, but probably more environmentally sustainable to use if you live near where it's grown. As with anything you use in your sustainable garden, think about the transport costs to get it from its source to you. However, even though I don't live anywhere near cane fields, I use it, and my garden, my worms, my microorganisms and I love it. Be careful, though, as it can acidify some soils.

Here are some inorganic mulches:

- **Glass:** Crushed rolled glass is an interesting mulch. It's very modern in appearance and comes in a range of colours, such as Red Wine Bottle, Clear Wine Bottle, Amber or Green Beer Bottle — hmmm. It does let moisture into the soil and can look interesting in a modern setting.

- **Granitic sand:** A popular choice in modern drought-tolerant Australian native gardens or succulent gardens. A good mulch for dry gardens that don't need much water.

- **Pebbles:** Be conscious about where they come from. Some are dredged from rivers, possibly overseas. Dredging pebbles from rivers anywhere to put onto your garden is bad practice as far as I'm concerned. Look for pebbles or stones from quarries or as offcuts from the stone masonry industry. Some good ones available are tumbled to look like they've spent years in a river. (Refer to Chapter 6 for more on sustainable landscaping materials.)

- **Weed mats:** This stuff lasts for ages and is made from black high-density polyethylene cloth, with the purpose of keeping weeds

down. If you must use it, make sure it's porous enough to let water in. You need to put some other mulch on top of it.

Mulching made simple

No matter what mulch you choose, mulching your sustainable garden is easy. Just follow these simple steps:

1. **Get rid of any weeds. Poison them if you must!**
2. **Make sure the soil is moist. Mulch after a good rain shower if you can.**
3. **Lay your mulch to a maximum depth of 8 centimetres. Don't mulch right up to the trunk or stem of your plants.**
4. **If it's organic mulch, you'll probably need to top it up about once a year.**

That's it. I told you it was easy.

Common mistakes with mulch

Mulch is great for your sustainable garden but you can get it very wrong. Before you put any mulch down, particularly on a new garden, you need to prepare the area well and make sure you've chosen the right mulch for your place.

Here are some of the more common mistakes and how to avoid them in your sustainable garden.

Putting mulch on top of weeds or lawn

Plonking a pile of mulch on top of a patch of lawn or a bunch of weeds you want to get rid of may seem like a quick and easy solution. Mulch is supposed to suppress weeds, right? Well, yes, but the idea is to get rid of as many of the weeds as possible before you put your mulch down or you'll just end up with weeds poking up again. Remember, many organic mulches improve and add valuable nutrients to your soil, which the weeds, of course, will take advantage of. You may even find they outgrow your precious plants.

Get rid of the weeds or grass first in a sustainable way. Here's a method I used at my place to build a garden on a lawn area. In early winter, I mowed the grass as low as my mower would go, let it grow for a week or so, then cut it low again. Then, after a heavy rain shower, I put down a thick layer of newspaper (about eight sheets in thickness) and wet it all thoroughly. Next, a load of sheep poo went on, to a thickness of about 8 to 10 centimetres followed by about 30 centimetres of pea straw on top of the lot. A few weeds popped through, but they were easy enough to pull out by hand. By spring, I had a fabulously mulched fertile garden bed to start planting out. My easy-mulch no-dig garden! It's pretty much like the method recommended for permaculture gardens (see Chapter 16).

Laying it on too thickly

You've probably heard gardeners say you need a good thick layer of mulch on your garden. What does that actually mean and how thick are you supposed to put it? Well, in my book, a thick layer of mulch on your sustainable garden means about 10 centimetres thick, thicker if you're building a no-dig garden and you're not planting yet. By the time you're ready to plant, the layer of organic mulch should have broken down to about 8 centimetres thickness.

Some people argue that to suppress weeds and retain water mulch needs to be 30 centimetres thick. Depending on the type of mulch you're using, all that's likely to do is absorb most of the moisture that goes onto it, often leaving the soil underneath as dry as a bone. Laying out a thick layer like that can also be very expensive.

I've heard of a garden supply yard telling a customer who was keen on using pebble mulch on his garden that it needed to be a minimum of 30 centimetres thick, but it would be better at around 40 centimetres. The gardener wanted to mulch a garden of 16 square metres. At $145 for a cubic metre of the stuff, this would have been a very expensive and unnecessary exercise when 8 to 10 centimetres would do the trick.

Putting mulch too close to your plants

A common problem is that, in your enthusiasm, you push the mulch up to surround all of your plants. Mulch holds moisture and warmth — if you mulch right up to the trunk or stems of your plants, you can create the ideal conditions for all sorts of pests, particularly diseases, to thrive. One common disease is collar rot, a fungal disease that basically rots the part of the trunk or stem closest to the ground. Give your plants a couple of centimetres' breathing space so you don't rot or burn them.

Not watering the ground first

Putting mulch down on dry ground can cause a major problem in your sustainable garden. If you put mulch onto a dry soil, when it's watered or it rains, you may well end up with nice moist mulch but with the moisture only making it through to the top couple of centimetres of soil underneath.

The best time to lay mulch is after rain, but a good deep soak with the hose is the next best thing. Make sure the water is soaking into your soil and not just running off the top. Sometimes, sandy soils can become hydrophobic, actually repelling the water. To check for this problem, give the soil a good soaking, then dig down a bit — 4 to 5 centimetres — and see if it's wet or at least damp. If it isn't, you need to dig in a bit of compost or maybe apply a wetting agent, which you can pick up from any nursery or hardware store, before you put your mulch on.

Using the wrong mulch

Surely any mulch is good for your sustainable garden. Well, not really. Very fine mulch can stop water getting to the soil; it hangs on to the water and the soil underneath stays dry.

Some bark mulch can cause a problem called *nitrogen drawdown*, which basically means the bark chips are too fresh. For example, you or a neighbour may have removed a tree and chipped up the timber to be spread on your garden — a great sustainable and cheap idea — but the chips need to begin to break down before they can be used on the garden because the decomposing process uses nitrogen in the soil. You may need to wait up to three months. If you put down bark chips and your plants look a bit yellow, this could be the problem. If you want to use the bark chips straight away, sprinkle a couple of

handfuls of blood and bone per square metre on top of the mulched area. This is a good way to get some extra nitrogen into your soil to compensate for what the bark chips take out.

Using mulch that's too fresh

A lot of gardeners out there like to empty the grass catcher of their lawnmower straight onto the garden, thinking that's a good, easy, free mulch. It's certainly easy and free, but maybe not so good. Stick your hand in a pile of grass clippings that have been sitting for a while. They're usually hot and often slimy. As they break down, they can get very, very hot. Not a good environment for the delicate roots of your plants. Better to compost the stuff and then put it on the garden.

If you do use lawn clippings as mulch, mix them with a bit of sawdust and spread them about 2 centimetres thick. The same goes for some other mulch you may get for free. The local tree-pruning contractor may have piles and piles of woodchips they're more than happy to drop off at your place. If it's just been chipped, put it in a pile somewhere for a couple of months, if you can, to let it break down a bit first. Free is good, but not if it harms your sustainable garden.

Not being exactly sure what's in it

If you do get mulch from your local tree contractor or maybe even your local council, make sure it has been aged a bit or leave it to age at your place. Far too many cases are reported of gardeners getting free mulch only to find it has come from an odd assortment of trees and shrubs and is full of weed seeds and bits of weeds (in some areas English ivy is common), and is so fresh it burns their precious plants. You can end up with one big sustainable gardener's headache.

Chapter 10

Worms: Slimy but Good

In This Chapter

- Understanding the benefits of worms in your garden
- Knowing your worms
- Making your garden worm-friendly
- Finding out how to set up and maintain a worm farm

Who could dislike worms? Garden-type worms I mean. They're harmless, and not too unpleasant to handle — they don't bite or sting! They appear not to do too much, just slide around in the soil, wriggling madly when you disturb them with a shovel, especially if you happen to chop one in half. Whoops! I feel sorry for worms that get lost on a wet footpath at night after a downpour — if they don't get back to the soil they're unlikely to survive when the sun comes up. They're possibly the first critters that children come into contact with, apart from snails, so maybe a childhood fondness for them remains.

In this chapter, I show you what worms can do for the soil of your sustainable garden and how they benefit you through decreased use of water and fertilisers, and therefore lower costs. Worms really are the miracle workers of your garden, especially if you grow vegies, which will be the envy of the district, and you can be smug in the knowledge that you're demonstrating environmentally sustainable practices by reducing the waste that goes to landfill.

And your kids can have so much fun with worm farms. They benefit from being exposed to these sorts of sustainable practices, and the science involved is fascinating.

Worming the Benefits into Your Garden

The plow is one of the most ancient and most valuable of man's inventions; but, long before he existed, the land was, in fact, regularly plowed and still continues to be thus plowed by earthworms. It may be doubted whether there are many other animals which have played so important a part in the history of the world, as have these lowly organized creatures.

Charles Darwin

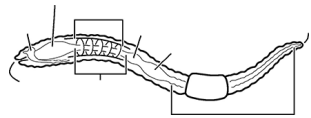
Worms, believe it or not, make your garden sustainable. They sustain your soil by improving its structure. Common garden earthworms constantly burrow and tunnel underneath your very feet and in your garden beds, eating and excreting and improving the soil, provided, of course, the diet they require is available.

Have you ever thought about what worms actually eat? Their diet is quite fascinating and the poo they produce from it is a veritable magic potion for your sustainable garden because it's full of digested bacteria and microorganisms. Worm poo also goes by the technical name of *castings* or, even more technical, *vermicasts*.

Technically, worm castings are not a fertiliser, but are really a *soil conditioner*, which is something you add to the soil to improve its structure and fertility (horse manure, lime, sulfur and gypsum are also soil conditioners). Worm castings and horse manure have negligible nutrient value in themselves but still improve the structure of the soil by attracting beneficial microorganisms, which improves the availability of nutrients to the plants. Lime, sulfur and gypsum assist with altering the pH of the soil, thereby making nutrients more available to your plants. Refer to Chapter 2 for more on soil pH.

I always thought that common garden earthworms just munched their way through buckets of dirt, leaf litter and other decaying matter in the garden, and in fact they do, but it's actually the tiny living microorganisms and bacteria in the soil and decaying matter that they're chasing. Microorganisms and bacteria are their meal of choice — and an earthworm can apparently eat up to half its bodyweight every day. Worms have a gizzard, just like birds, and it is in this gizzard that the microorganisms and bacteria, and the soil ingested along with them, are ground into the finest granules. This all passes through the digestive tract. It seems the worm is just one long piece of gizzard and intestine, as Figure 10-1 illustrates.

Figure 10-1: The digestive tract of a common garden earthworm makes up most of its anatomy.



The excretion (poo, castings, vermicasts or whatever you like to call it) at the end of it all is rich and full of bacteria from the worm's innards. It also contains a mix of soil and subsoil from the earthworm tunnelling near the surface and deeper down in the earth. This is the magic potion that transforms your soil from dirt to a fertile and living body.

Earthworms give your soil a beautiful crumbly structure, and it will be well aerated from all of the tunnelling and burrowing going on. Aeration allows for greater water penetration and moisture-holding capacity of your soil. Your plants are invigorated and thrive because the roots find it much easier to penetrate the soil to find an abundant source of moisture and readily available nutrients, all thanks to the microorganism-rich worm castings. If the soil in your sustainable garden happens to be acidic (where the pH is under about 7 — refer to Chapter 2), worm castings assist with raising the pH to a more neutral reading. Worms actually excrete calcium carbonate (lime), and these secretions assist in raising the pH of a soil. Pretty clever little critters.

What Worm Is That?

While the anatomy of different varieties of worm is much the same, worldwide there are more than 6,000 species! Just as Australia and New Zealand have unique native plants and animals, so too they have unique native worms.

New Zealand has at least 171 species of native earthworms and 23 non-native species. Australian natives are thought to total around 1,000. In Australia, the 'Gippsland Giant' (*Megascolides australis*) has been recorded at 4 metres in length, with the average length being 2 to 3 metres, and a diameter of 2 centimetres. A small child could get lost in the tunnel of that worm! Another species from New South

Wales, *Notoscolex grandis*, has been recorded at 150 centimetres long, with the thickness of a garden hose.

The common garden earthworm, however, is actually an introduced species, brought to Australia and New Zealand by Europeans over the last couple of centuries. They were in soil containing exotic plant species that settlers wanted to cultivate in their new and strange land, to make their new environment seem more like 'home'. This particular type of worm, indigenous to Europe, is reddish grey in colour and usually about 6 or 7 centimetres in length. Like most worms, they come to the surface at night when it's dark and cool.

With the cover of darkness they are safe, with no hungry pesky birds around to eat them. While on or around the surface during the night, they munch on the lovely leaf litter and leave their rich castings behind to enrich your sustainable garden. They also mate on the surface. During the day they burrow and tunnel under the ground, keeping well away from predators.

The earthworms you encounter in your garden soil are very different from the types of worm that are used in worm farms, and I deal with these types of critters in the section 'Types of worms for worm farms' later in this chapter.

The sex life of worms

Worms are pretty good little breeders. Some worm species are able to mate from two to three months old. Most worms are hermaphrodites, having both male and female organs, though they're not self-fertile.

Worms mate every 7 to 10 days. About 27 days later they produce an egg capsule containing between 2 and 20 eggs, though usually only one juvenile hatches, in about three weeks.

Under the right conditions, including access to the right food and at optimum temperature, worms can double their population in two to three months. Their life span, however, is only about a year, depending on the species.

Attracting Worms and Keeping

Them

Worms are hugely beneficial to your sustainable garden. The question is how to get them there in the first place, in numbers that are of benefit, and how to keep them happy so they'll breed and populate your garden beds. You have to go back to the foundation of your sustainable garden — the soil. If the foundation is poor, some reparation work is necessary. Don't feel overwhelmed, though, because a good number of worms probably already populate your garden — you just don't see them because worms only emerge under the cover of darkness to feed.

Creating the ideal conditions

Worms detest sunlight and dryness — their delicate little bodies can't survive those sorts of conditions. Worms are also a tad fussy when it comes to the pH levels in a soil. Ideally, the pH of your soil needs to be between 5.5 and 8.5 to attract worms and keep them healthy. Worms find a soil with a pH out of that range inhospitable and won't thrive; in fact, they'll die or move somewhere else.

If the soil in your sustainable garden happens to be acidic (where the pH is under 7), you can purchase worm castings to assist in raising the pH to a more neutral reading. Alternatively, an application of lime will help bring the reading back to neutral.

Bacteria and microorganisms, the worms' favourite food, thrive in leaf litter and decaying organic matter. The microorganisms and bacteria break down the organic matter, which is very attractive to worms. So you need to ensure that your garden beds have a good coverage of mulch or decaying organic matter, leaf litter or, ideally, *humus* from your compost heap, which is the decayed and broken-down organic matter. Humus is perfect for spreading around on your garden beds, together with other organic matter.

Now, when I say 'organic matter', I'm not recommending you chuck banana peels, spud peelings or apple cores straight onto the garden. Pretty obviously, these sorts of things are just going to sit there looking pretty unattractive to visitors who come to admire your sustainable garden. These scraps are exposed to the wind, rain and

sun, and so are not a fabulous host for bacteria or microorganisms. The microorganisms will either drown, become dehydrated or get badly sunburned! Ideally, food scraps need to be composted in small pieces, mixed with other matter, covered and left in a sheltered spot for a period of time. (Refer to Chapter 9 for all you want to know about composting.)

You can still provide organic matter without composting, however. Take a look around your sustainable garden. If you have leaf litter and decaying matter at the base of your trees and shrubs, rake it up and spread it over your garden beds. Chances are it already contains an army of bacteria silently doing what they do best, munching up decaying matter.

Remembering the type of environment that worms like — darkness, dampness and decaying matter — consider laying wet newspaper over your garden beds, then spreading mulch over the top. This creates an attractive and safe environment for your family of worms. The wet newspaper keeps the surface of the soil moist, the mulch on top keeps the paper moist, and eventually bacteria breaks the whole lot down, resulting in even more food for your worms.

While damp conditions are essential to the health of your worms, you don't want to have your garden beds sodden, because worms don't like that either. Worms don't have lungs; they actually breathe through their very delicate and thin skins. A worm will drown if it is inundated with too much water.

Entrenching your worms

If you want to cultivate earthworms in your garden and don't think you're up to creating and maintaining a worm farm, which I detail in the rest of this chapter, you may want to try a method called *trenching*. In this method of revitalising and nourishing your soil, you put scraps, manures and earthworms into a trench. Here's how:

1. **Dig a trench, a minimum of 1 metre long, about 10 centimetres wide and to a depth of 25 centimetres.**

   In fact, you can create a trench the entire length of your vegie garden, for example, to form a border.

2. **Fill the trench with animal manure and kitchen waste.**

Only use manure from grass-eating animals, such as horses, cows, sheep, goats or chooks, and break down the kitchen scraps to, at most, 1-centimetre pieces.

3. Transfer some worms from your compost and scatter them over the manure and scraps.

If you don't have a compost heap, don't worry too much — the trench attracts worms.

4. Cover the manure and scraps with 2 to 5 centimetres of soil and let the worms do their thing.

The worms move through the organic matter, leaving rich castings behind, increasing the fertility of your soil and making all sorts of valuable nutrients available to your plants. When the worms have worked their magic, you can extend the trench, as they naturally move on to where a food source is freely available — in the next section of your trench.

Some people dig kitchen waste straight into the garden, in small patches all over the place. This practice is not recommended, however, as you can unwittingly contaminate your soil.

If you decide to give trenching a go, make sure you give the kitchen scraps a bit of a whizz in the blender. Not so they're virtually liquid, but the smaller the particle size, say 1 centimetre or less, the faster they break down, providing a greater amount of bacteria to feed your worms. The process of transforming waste into castings is also a lot faster. And any seeds are broken up so you won't have any unwanted plant species popping up in your trenches.

Worm Farms: What Are They About?

Around a quarter of the average household rubbish bin is filled with food scraps. A tremendous amount of organic waste goes into landfill daily. Generally encased in a plastic bag, this stuff festers and rots

and becomes a stinking, anaerobic mess giving off toxic methane gases, releasing carbon dioxide into the atmosphere and polluting groundwater.

Such a terrible, terrible waste and so environmentally unsound. These kitchen food scraps can so easily be turned into a nutrient-rich matter to improve and increase the sustainability of your garden by improving the soil fertility. All you need to do is buy or make yourself a worm farm, which isn't difficult or expensive. After the farm is set up, it requires very little maintenance, and almost looks after itself.

Types of worms for worm farms

One important point to remember is that in a worm farm you can't use just any common old garden earthworm, even though your underground friend is very beneficial in your sustainable garden. Worms that prefer to reside in a worm farm are a different species to your valued garden earthworm. The worm farm variety would quickly die in the open environment of your garden and, likewise, the earthworm would find a worm farm way too rich in nutrients.

Unlike earthworms, which only come to the surface to feed at night, worm farm species are surface-dwellers. They enjoy living in a deep and rich surface layer of decaying matter, such as leaf litter, much like what you find in a rainforest.

Worm farm worms are generally referred to as 'reds', or 'red wrigglers', 'tigers' and 'blues', or 'Indian blues'. They can sometimes be difficult to tell apart, but usually the tiger worms have stripes, the other two either look reddish or bluish. Pretty easy really. The important thing to remember is that they all enjoy the same type of living conditions — darkness, moisture, coolness, and plenty of food and oxygen.

You can buy worms for your worm farm from commercial suppliers, usually listed in your phonebook. To get started you need approximately 1,000 worms, bought by weight (really, I don't think anyone is going to count them one by squirming one); that is, about 250 grams, regardless of what size farm you have. Worms self-regulate their own populations so you won't end up with overcrowding. The more you start with, the quicker they'll consume your food waste, and the faster they'll produce rich castings, the excretion that is full of digested bacteria and microorganisms that is so good for your garden, and another nutrient-rich product, a liquid fertiliser I refer to as worm wee.

Worm wee is the liquid that accumulates at the very bottom of the worm farm. It's a great fertiliser, but is quite potent and so should be diluted at a rate of about 1 to 5, so that it looks like a weak black tea. It's sometimes called *vermicast tea*. You can apply the diluted worm wee to the base of all your plants or to the soil, or use it as a *foliar spray* that you use on plant foliage.

The castings, or vermicasts, from your worm farm can be:

- Spread to a depth of approximately 2.5 centimetres around the base of your plants.
- Applied around the *dripline* (the outer edge of the ground beneath a tree or shrub) of fruit and native trees during spring and autumn, and watered in well.
- Used as a component of homemade seed-raising mix or potting mix (see Chapter 14 for more on making your own potting mixes).
- Diluted with water as an excellent fertiliser. Mix a small spadeful with about 9 litres of water, stir and apply.

Setting up your worm farm

The important first step is locating a suitable place for your worm farm. It must be cool and shady, particularly during the warmer parts of the year. Ease of access is also important. Disposal of kitchen scraps into the worm farm has to be easy for all members of the family. No-one enjoys tripping out to empty the scrap bucket on a cold night if the worm farm is located in a dark corner of the backyard, under a low-growing prickly bush. And you need to be able to get a wheelbarrow up close, so you can shovel the castings out. Considering these things is important.

If you decide to buy your worm farm, quite a few different types are available from garden centres or hardware shops — and they come with instructions. They're usually made of plastic and have three containers that sit on top of each other. The bottom container provides a filter, the middle container is for collecting the castings and the top is where the worms live, eat, mate and lay their egg capsules.

Bought containers are effective and user-friendly because they are purpose-built, but you can build your own, very cheaply, and maybe have a bit of fun doing it. A recycled, rustic receptacle for worms fits perfectly in a sustainable garden.

Essentially a worm farm is about layering. It is essential that the layers are:

- Well aerated, so that the worms and bacteria can breathe.
- Deep enough for the worms to burrow down in so they can keep cool (especially important for the top layer where the worms hang around for the food).
- User-friendly, allowing for easy drainage of the wee and easy removal of the castings from the middle layer, without removing worms or their egg capsules in the top layer.

In order to increase the population of your worm farm, egg capsules must remain in the top layer with the decaying matter and food scraps.

The set-up of a worm farm is about layering, patience and not killing your worms with kindness by overfeeding them. I know they consume half their bodyweight in a day (so they say) but there is a limit to gluttony!

If you want to make your own worm farm you have a few options.

The bath or laundry tub worm farm

Make use of an old bath or laundry tub by converting it to a worm farm! Check out Figure 10-2 and follow these steps:

1. Cut some slit holes into the side of the tub and place it on blocks.

An angle grinder is probably best for this. The holes are essential for drainage and aeration and should be about 5 centimetres up the sides of the tub. In an average laundry tub you'd maybe have two horizontal slits on each side, about 10 centimetres long and 10 centimetres apart.

2. Place some fine mesh over the plug hole and then cover the base of the tub with gravel, about 5 centimetres deep.

Place a bucket under the plug hole to collect the worm wee.

3. Cover the gravel with some weed mat, shadecloth or hessian.

This prevents the castings from mixing with the gravel, and placing it in two sections makes removal of the castings much easier.

4. Soak coir fibre or straw with water and place, to a depth of about 10 centimetres, in one half of the tub.

5. Cover with aged manure to a depth of 5 centimetres and then place your worms on top.

Finished compost (humus) could be used instead of manure, but manure helps to speed up the decomposition process.

6. Cover with wetted carpet or a thick layer of wetted newspaper (about ten sheets).

7. Feed your worms your kitchen scraps by scattering a few handfuls, to a depth of about 5 centimetres, underneath the carpet or newspaper every couple of days, still using only one half of the tub.

8. When the scraps no longer look like scraps, repeat steps 4 and 5 (but leave the worms where they are) in the other half of the tub and begin piling kitchen scraps up on that side, with a good layer of wetted carpet or newspaper on top.

The worms quickly migrate to their new food source, leaving their valuable castings behind, ready for you to remove.

9. After about three weeks, to allow for egg hatching and subsequent baby worm migration to the other side of the tub, remove the castings.

Carefully lift off the carpet or newspaper and scoop up the castings, or pick up the weed mat, shadecloth or hessian and scrape the castings off, and apply to your sustainable garden.

Figure 10-2: Worm farms are all about building layers.

Cross-section of a Laundry Tub Worm Farm
Food scraps
Aged manure to 5 cm
Weed mat, shadecloth or hessian
Wet carpet or newspaper
Worms
Straw or coir fibre to 10 cm
Gravel, 5 cm deep
Drainage hole

The polystyrene box worm farm

This type of worm farm is cheap as chips to make. All you need is two foam boxes with lids, approximately 60 ´ 90 centimetres and 30 centimetres deep. Greengrocers and supermarkets usually have an abundance of these and will give them away to a good home. Here's how to put it together:

1. Over an area about the size of a small plug hole, make some holes in the bottom of one of the boxes, about a centimetre

apart.

A sharp skewer makes holes big enough to allow drainage of the worm wee and aeration.

2. Place some flyscreen mesh or something similar to cover the bottom of the box, including the drainage holes.

This prevents any of the valuable worms from falling into the bottom box and drowning in the worm wee. Some people place a rock or brick in the bottom box so that any worms that do escape can wriggle onto the rock to save them from drowning.

3. Place the pierced box on top of the other empty box.

4. Into the top box, create a nice little bed about 10 to 15 centimetres deep with layers of damp organic matter, like leaves, aged horse manure, kitchen scraps, compost and shredded newspaper, and add your worms.

Make sure all the materials are quite damp before adding your worms.

5. Cover the worms with wetted newspaper or hessian to keep the worm farm a regular temperature, and place the lid of the foam box on top.

6. Regularly add more scraps to the top of the bedding in small amounts.

Feeding them every couple of days keeps them happy; just monitor how they're going. If they seem to need more, add more. To speed things up, put scraps through the blender, but don't liquefy them. The smaller the scraps, the quicker the bacteria multiply, and the quicker the worms get to work making castings.

7. After a few months, when you can see rich, dark brown soil-like matter under the food scraps, the castings are ready to harvest.

You should have around six to eight cups of this stuff, so you might want to don some rubber gloves. Using your hands, move aside any food scraps and carefully scrape up handfuls of castings. Worms hate light and so will quickly clear the area once exposed. Any that are collected in your hands can be gently returned to their nutritious home in the farm. When you have collected your castings, remember to spread the food scraps back over the area.

8. Check the bottom box regularly and empty any worm wee, or you can add a clever little tap, as shown in Figure 10-3.

Figure 10-3: Polystyrene worm farms are cheap and easy to make, and make people like Sophie Ciavarella happy!

Keeping them happy and well fed

If you want to have healthy and happy worms, you need to get a couple of things right. Where they live and what they eat is important to their wellbeing.

The right location

The location of your worm farm is crucial to the wellbeing and happiness of your worms.

The worm farm must be situated in a protected and sheltered area in your sustainable garden. Worms will not survive if the farm becomes too hot and they can't tolerate direct sunlight. They will cope with temperatures between 10 and 30 degrees Celsius, but in those warm summer months ensuring they are covered with wet hessian or newspaper is important. Remember to check regularly that it remains wet.

You can also suspend a shadecloth cover over the worm farm. This keeps it a lot cooler and still retains good ventilation. Remember, unlike earthworms, these worms are surface-dwellers and, in a worm farm, even if they wanted to burrow down to cooler areas, they aren't able to.

The right diet

Worms generally eat anything that was once living, but they do have favourites. And some things are detrimental to their health.

Worms love to munch on:

- Fresh food and vegie scraps — not collected over the space of a week
- Tea leaves, coffee grounds and crushed eggshells
- Wet shredded newspaper, egg cartons, even pizza boxes
- Manures — aged horse and sheep manures especially
- Vacuum cleaner dust and hair clippings

Here are food items you need to keep to a minimum, and possibly avoid altogether:

- Citrus or citrus peelings
- Garlic
- Onion peel
- Potato peels (though these are okay in moderation)

And don't bother feeding them meat or bread — you won't be feeding the worms but the local mice and rats, and won't do the worms any good at all!

Just remember not to overdo it with food. Worms tunnel upwards so, if they haven't eaten almost everything you put in there a few days earlier, and you add more, they bypass the old scraps in favour of the new. This results in the older scraps becoming rancid and foul-smelling. If this occurs, stop feeding until the odour has gone, so that the worms are catching up with their tucker.

Handling and caring for your worms

If you have to handle your worms for any reason, to move them or just to look at them and show the kids, do it carefully and gently. Make sure that your hands are clean, not covered in fuel from topping up the mower or chainsaw, or covered in any other chemical. Worm skin is very delicate. On the other side of the coin,

worms have no diseases, so you are quite safe!

One thing that worms detest more than sunlight and dry conditions is your spade! Contrary to popular belief, if you accidently chop a worm in half with your spade, it will die, and die a most unpleasant death. Sometimes — and only sometimes — if the chop is far back enough along the body, it may grow another tail, but not always.

Part IV

Growing Plants Sustainably

Glenn Lumsden

‘We’re informed you’ve been growing grass.’

In this part . . .

Go to your local nursery or garden centre and you could be dazzled by the array of plants for sale. How do you figure out which plant is

right for your sustainable garden? You can always ask the nursery person, but, unfortunately, even then you may still be confused.

In this part, I give you some tips on choosing the best sustainable plants for your place, whether you live in Karratha or Kaikoura, and where to find more information to help make your choice.

If you want to grow your own food, this is the part you need to read. From fruit and vegies to nuts and herbs, growing your own — in the ground or in pots — means you can be well on your way to buying less from the greengrocer each week.

This part also tackles what to do about lawn. With all the problems these days with water, the 'traditional' lawn is almost a dirty word! If you're like me and love a lawn, I show you ways to have a lawn and still be sustainable.

If you have no space for a lawn, or much of a garden at all for that matter, pots and other containers are a great alternative. Potted plants have some special needs, however, and in this part you learn how to look after your pots and potted plants, even how to grow vertical gardens, or spread a little further afield, to your local community garden.

Chapter 11

Selecting Sustainable Plants

In This Chapter

- Working out what water-wise gardening really is
- Understanding sustainable, climate-friendly plants
- Discovering some great performers for your place

To be a successful sustainable gardener, you need to get to know sustainable plants, which often means plants that are water-wise. In this chapter, I explain what that actually means, and the difference between a drought-tolerant plant and a water-wise plant. In both Australia and New Zealand, the climate dictates what you should and shouldn't plant in your garden, not fashion or what the gardening shows or magazines may tell you to plant.

I introduce you to climate-friendly, or climate-wise, gardening, which is kind of the same as water-wise gardening, only a little different. It's all about understanding the climate where you live as it is now, not what it was or what it might be in the future, becoming attuned to the changing seasons and the wonders of plants in different seasons.

A climate-friendly garden is a garden designed and planted with the species suited to the soil, climate and water availability, and, well, plants that are just right for the spot. It makes sense to use native plants as much as possible in your climate-friendly garden, even your state or national emblem if you're in the right region. Native plants are naturally suited to their environments and, of course, native plants provide a home and a feed for native critters.

In this chapter, I also include regional lists of a few great, sustainable, climate-friendly plants to grow at your place to get your sustainable garden started.

Drought-Tolerant Plants? Try Climate-Friendly

Australia is the world's driest inhabited continent, and recent droughts in many areas have forced even city-dwellers to take on board the importance of not using water unnecessarily. New Zealand may have a bit more water, but that doesn't mean you should be wasting it either. You always need to be mindful of how much water you actually have; just because it rains doesn't mean you should take your water supply for granted.

However, not everyone lives in areas that are experiencing drought; in fact, some areas are usually wet! Perhaps it's time to stop describing plants as 'drought-tolerant' and 'water-wise', and start simply saying that plants should be climate-friendly, suited to all aspects of an area's environment and climate. By learning about the best plants for your area, you can create a magnificent, healthy, productive and climate-friendly garden.

Assessing plants' water needs

If your area experiences low rainfall, you need to look for plants that will tolerate your environment. What makes a plant water-wise or drought-tolerant and what do these terms actually mean?

- *Water-wise* plants are those plants that, when established, live off the natural rainfall of a particular region, whether that's 30 millimetres or 1,000 millimetres, with no supplementary watering needed. So what may be water-wise and sustainable at your place may be a complete disaster at the other end of the country.

- *Drought-tolerant* plants have low or very low water requirements after they're established. *Dry-tolerant* means the same thing. Consider the subtle difference between this and water-wise plants.

- *Xerophytic* plants, on the other hand, are tough plants able to survive in desert areas. Think cactus! Don't mistake drought-tolerant plants for xerophytes. Sure, they're great in your garden when it's dry, but if you live somewhere that gets seasonal rainfall and the cactus garden isn't well drained you may well end up with rotting plants.

Far too many gardens are planted out with drought-tolerant species, such as the *Chamelaucium* (Geraldton wax) or some of the newer *Phormium* (New Zealand flax) cultivars, that look great when it's dry, but when the rains come they drown. Plants that are drought-tolerant generally hate *wet feet* (being waterlogged) and might simply turn up their toes. If you want some of these sorts of plants at your place, and you live in an area of high rainfall, you may need to build raised beds and provide perfect drainage to stop them getting wet feet. Remember that water is not the only consideration in a sustainable, climate-friendly garden.

Some plants available in garden centres or nurseries may not be appropriate for your area. Many plant labels say in big bold letters 'I'm drought-tolerant', 'I'm water-wise', or even 'I live off recycled water'. You need to think about what these statements really mean for your garden. A plant that is promoted as living off recycled water sounds great. But what sort of recycled water? Would that be greywater? Or what? And are 'drought-tolerant' or 'water-wise' plants tolerant of severe drought or just periods of dry?

With all this water-wise talk these days, you may easily forget that all plants need water. If you want a garden that needs no water at all you're best off buying plastic plants! But then they still need a wash to get the dust off occasionally. Most plants need a bit of water to get established, but if you choose wisely, they should do pretty well left to their own devices after that, if you have, say, moderate rainfall.

Some plants need more water than others. When you look for water-wise or drought-tolerant plants, you need to understand what that actually means at your place. Getting rain every other week may be normal in your region, and a month without rain may be considered a drought; yet, somewhere else, months without rain is expected. Just remember, don't go on past rainfall to work out what's normal and what's not; times are changing and gardening practices need to change with the times.

If you haven't already done so, you need to wean yourself off the idea that you can just water and plant whatever you like, when you like. You need to stop relying on precious drinking water to maintain your garden. Back in the olden days, gardeners didn't have massive sprinkler systems and hoses with trigger nozzles.

In fact, my granddad managed to grow a luxurious garden, complete with rolling lawns and a dazzling array of flowers. This gorgeous garden not only provided a cooling place to relax during the hot New South Wales summer, but also enough fruit and vegies to feed a family of seven and still have some left over to swap with the neighbours. All on tank water.

Switching to climate-friendly gardening

The best advice I can give to gardeners trying to work out what is water-wise or drought-tolerant is to think climate-tolerant, or climate-friendly, which also sounds much nicer.

Whenever you look for plants for your sustainable climate-friendly garden, you need to ask yourself or your local nursery person a couple of simple questions:

- Is the plant suited to my local environment and climate?
- Is this plant a weed in my area?

By taking the time to get to know these simple things you're well on your way to creating a sustainable climate-friendly garden. Unfortunately, many plants in some nurseries aren't at all suited to your local climate and gardeners buy them just because they are there and they look pretty, with no regard to whether or not they're suited to the environment and climate at their place. Other plants are so hardy they risk becoming weeds, taking over other species, particularly native plants.

To be a climate-friendly sustainable gardener, get to know and understand your climate. That includes the wind, length of daylight and intensity of sunlight. Understand your water availability and quality, whether you have frost or snow, how much rainfall you can reasonably expect and when. And don't forget the soil type (refer to Chapter 2).

Then work out what your plants need to do in your garden. Maybe they need to form a barrier and create a micro-climate to protect other plants from the wind or sun. Perhaps you live in a tropical or

subtropical area, so you need plants that can thrive through the long dry, and cope with heavy seasonal rains and hot, humid conditions. Plants that need winter frost to germinate or set flower won't work in that climate either!

To be a climate-friendly sustainable gardener, you need to also think carefully about when you plant. You need to get your plants established when water is available so you don't need to rely on any extra watering. Not only does this conserve water, it's less work for you.

In 2007, the Gold Coast City Council in Queensland introduced the Free Tree Scheme to Green the City, giving out free trees to schools and residents for home gardens, schools and streetscapes. But the trees are only given out early in the year when there is the right amount of rain to help the trees to establish. Sensible move.

No matter where you live, by thinking carefully and choosing the right plants for your climate-friendly sustainable garden, you not only create a haven for you and your family, but a haven for local birds, insects, animals, fungi and microorganisms that together help to make a balanced, healthy planet.

Selecting Climate-Friendly Plants

When you're trying to decide what to plant in your garden, a good idea is to take a wander around your neighbourhood. See what grows well, what thrives without supplementary watering. No matter where you live, you'll see gardens, whether in public parks or private homes, where the plants are thriving on natural rainfall or in some cases minimal watering. You too can have a tough water-wise, or should I say climate-wise, garden.

Flaunting floral emblems

An interesting and patriotic idea could be to include your state floral

emblem in your sustainable garden, although, if you live in Tasmania and have a small inner-city garden, a *Eucalyptus globulus* or two might be a bit tricky. It's a whopping great tree!

Just for fun, here are the floral emblems of Australia and New Zealand:

- **Australia:** Golden wattle (*Acacia pycnantha*)
- **Australian Capital Territory:** Royal bluebell (*Wahlenbergia gloriosa*)
- **New South Wales:** Waratah (*Telopea speciosissima*)
- **Northern Territory:** Sturt's desert rose (*Gossypium sturtianum*)
- **Queensland:** Cooktown orchid (*Dendrobium phalaenopsis*), now considered a vulnerable species
- **South Australia:** Sturt's desert pea (*Swainsona formosa*)
- **Tasmania:** Tasmanian blue gum (*Eucalyptus globulus*)
- **Victoria:** Common heath (*Epacris impressa*)
- **Western Australia:** Red and green kangaroo paw (*Anigozanthos manglesii*)
- **New Zealand:** Silver fern (*Cyathea dealbata*)

What's your vote?

Ask some people in New Zealand what their national flower is and they'll tell you it's the bright yellow kowhai (*Sophora chathamica*); ask others and they'll say it's the pohutukawa (*Metrosideros excelsa*). Although not strictly a plant, more of a plant part, the koru is another of the national plant emblems. *Koru* is the Maori name for the unfurling fern frond of the silver fern, symbolising new life, growth, strength and peace. That one gets my vote!

Using eco-sourcing or local provenance

When you're looking for *indigenous* plants for your sustainable garden — that is, plants that are native to your local area — look for plants that have been grown from locally sourced seed or cuttings. In New Zealand this practice is called *eco-sourcing*; in Australia, *local provenance*.

Plants have developed over thousands of years in different parts of

both Australia and New Zealand, and, although they may be the same genus and species, they have slight regional differences and tolerances. For example, in Victoria, the coastal form of *Banksia marginata* and the inland form of *Banksia marginata* look pretty much the same, but try planting the inland one on a windswept cliff that cops the full brunt of the winds from the Southern Ocean and see how happy it is! By using provenance or eco-sourcing, you're helping to maintain the genetic diversity of native plants and getting the right one that will thrive in your sustainable garden.

Native plants can be weeds! In Australia *Acacia baileyana* is a garden escapee that has spread rapidly outside its natural range. Around Wellington in New Zealand, *Metrosideros excelsa* has real potential to become an environmental weed. Just because it's a native doesn't mean it's good. As the climate changes, some of your favourite native garden plants may just become weeds of the future. So watch out.

Choosing and caring for your plants

Plants that are the most water-wise have adapted over time and have the ability to hang on to precious water during dry periods. If you live in a dry area and are looking for plants that are water-wise, here are a few characteristics to look out for, or ask about at the nursery:

- Fleshy leaves
- Shiny, grey or hairy leaves
- Leaves that hang vertically, avoiding direct sunlight
- Deep root systems rather than shallow surface roots
- High oil content, as these plants don't need as much water
- Ability to produce lots of seed to provide replacements if the plant dies in a drought (be careful, though, as this is one of the characteristics that can make a plant a weed)

In any region, whether in Australia or New Zealand, grouping plants together that have the same or similar needs is important. This

enables you to water and feed each group with the same amounts and regularity (refer to Chapter 3 for information on watering practices, and Chapter 5 for more on garden design). While you're there, get rid of any weeds — most plants hate competition — and this goes for both Australian and New Zealand natives. However, plants that are native to Australia or New Zealand generally have slightly different requirements.

Here are some tips for growing Australian native plants:

- If you need to build your beds up, don't spread soil on top of the garden; mix it into the existing soil.
- If a plant needs full sun, make sure it gets it.
- Most Australian natives don't like wet feet, so don't give them too much water; let them dry out from time to time.
- Avoid fertilisers that are high in phosphates; they may kill your Aussie natives.
- Use organic mulch or an inorganic mulch such as granitic sand or pebbles, or use groundcover plants.
- Prune only lightly after flowering; most native plants don't take kindly to a heavy prune.

The most important factor when choosing which Aussie native plants to grow is where they come from in Australia and if they will suit your climate. Plants native to Sydney are used to a wetter summer than those native to Perth where the summers are dry.

For New Zealand native plants, follow these tips:

- Many native plants like soils rich in organic matter.
- Don't plant on hot, sunny or windy days.
- Mulch well to keep in moisture, especially in drier areas.
- Some plants like a hard prune, whereas others don't. Get to know the pruning requirements of your plants.

The most important thing to remember when filling your New Zealand garden with fabulous New Zealand natives is that, if you live in the South Island where it's cold and in some parts snows in winter, plants native to the North Island where it's more temperate will probably turn up their toes. Your best bet is to go with those natives adapted to your particular part of the country.

Australian Climate-Friendly Performers

I devote the rest of this chapter to a useful listing of some of the top performers region by region. Remember, the best knowledge is local knowledge. Most Australian states have wide variations of climate so the plants can also vary widely from region to region, although many plants from, say, tropical north Queensland have been introduced to subtropical south-east Queensland and can do just fine.

Use these lists as a guide and ask your local nursery or native plant specialist for advice. A web search for native plant nurseries will turn up some good places to start.

These plants may have common names that are different from the ones I've used here. The trouble with common names is they can vary from place to place and apply to different species of plants, so you may end up with the wrong thing. Best to always stick to the botanical names, if possible. In case you only know the common names, though, I've listed these plants alphabetically according to common name, so you should be able to find the correct botanical name.

Australian Capital Territory: The bush capital

Canberra, Australia's national capital, houses much more than just politicians! The cool-climate woodlands and forests are full of wonderful and diverse plants, so including as many as you can in your garden makes sense. I suggest a visit to the Ellis Rowan garden at the Australian National Botanic Gardens for some brilliant ideas on using the locals at your place. Table 11-1 gives you a few to start with.

Table 11-1 Australian Capital Territory Native Plants

Botanical Name	Description
Banksia spinulosa	Banksia, hedgehog	2 metres high with a 70 centimetre spread, has narrow leaves 30 centimetres long and insignificant flowers occurring on branching spikes.
Boronia pinnata	Boronia, pinnate	1 metre, with small leaves and dark pink four-petalled flowers in

spring.

Westringia fruticosa (coast rosemary) 1.5 metres high and wide, with very short leaves that are very fine and bright green, a black stem and conspicuous red flowers in spring.

Callistemon viminalis (weeping bottlebrush) 2 metres tall and wide, with large leaves for a callistemon and brilliant red flower spikes in spring and summer.

Eucalyptus nicholii (narrow-leaved black peppermint) 15 metres high, with dull green leaves and creamy flowers that emerge from green flower buds in summer.

Correa alba (white correa) 50 to 70 centimetres with a white woolly stem, silvery grey leaves and golden flowers in loose clusters appearing profusely from spring to summer.

Banksia ericifolia (heath banksia) 1.5 metres tall with a spread of about 1.5 metres, with dark green leaves, minutely fringed, and white to deep pink, bell-shaped, five-petalled flowers. Fruits are small rounded nuts that develop in spring and summer.

Brachychiton rupestris (Queensland bottle tree) 2 metres tall and 1.5 metres wide. Heart-shaped leaves and red flowers with white tips in winter and spring.

Acacia podalyriifolia (Queensland silver wattle) 8 metres tall, with sickle-shaped green leaves and large, deep golden yellow, ball-shaped flowers that appear from spring to autumn.

Dianella caerulea (blue flax lily) 60 centimetres high with 25-centimetre spread, with stiff grass-like leaves and tubular pink flowers appearing in spring and summer.

Banksia spinulosa (hairpin banksia) 2 metres, with narrow leaves 6 centimetres long and yellowish bronze cylindrical flowers about 18 centimetres occurring in summer and autumn.

Hardenbergia violacea (false sarsaparilla) 50 centimetres tall and 80 centimetres wide with green to red leaves (depending on climate), white five-petalled flowers and small globular berries in winter and spring.

Common Name Botanical Name

Grevillea 'Canberra Gem' about 50 centimetres tall and 1.5 metres wide with glossy green leaves and five-petalled yellow flowers in spring and summer.

Brachyscome multifida (cut-leaved daisy) to about 1 metre by 1 metre, with long narrow leaves and pink star-shaped flowers in spring.

Myoporum parvifolium (creeping boobialla) to about 30 centimetres and a spread of 3 metres, with broad leaves and pinkish mauve flowers in spring.

Dianella revoluta (black-anther flax lily) height and spread of 1 metre, deep green leaves, small deep blue flowers with yellow anthers and small blue berries.

Wahlenbergia gracilis (native bluebell) to 40 centimetres with a spread of 25 centimetres. It has one erect flowering stem with blue, five-petalled, bell-shaped flowers and narrow leaves to 7 centimetres long.

Pennisetum alopecuroides 'Hameln' growing to a height of 1 metre and a spread of 50 centimetres. It is erect with a flowering stem and narrow greyish leaves and plume-like flowers.

Brachyscome multifida (cut-leaved daisy) growing about 20–40 centimetres tall and 30 centimetres wide, with white to purple daisy-like flowers that appear in early summer.

Viola hederacea (native violet) 2 by 2 metres, with aromatic dark green leaves and white star-shaped flowers appearing winter and spring.

New South Wales: The premier

state

New South Wales is the home of Australia's highest mountain, Mount Kosciuszko, at 2,228 metres. The coastline stretches 1,460 kilometres and, although the state's land area only covers one-fifth of the country, it is the most populous state in Australia. New South Wales has more than 6,000 native plant species across a wide range of climates and environments.

Table 11-2 New South Wales Native Plants

Common Name	Botanical Name	Description
Blue Lilly Pilly	*Acmena smithii*	Shrub or tree to 19 metres in height. Small prickly leaves are bright green; numerous white, sweet-smelling flowers in summer. Heart- or kidney-shaped fruit.
Black Wattle	*Acacia mearnsii*	Tree to 15 metres, with bluish green, fern-like leaves and whitish yellow ball-shaped flowers with a very sweet smell.
Blue Flax-lily	*Dianella tasmanica*	Grows to 60 centimetres tall, with long, bladed grey-green leaves and pale blue flowers on the end of flower stalks 3–5 millimetres long in spring.
Cheesewood	*Glochidion ferdinandi*	Tree to 6 metres high; flowers are calyces only, which are white in spring and turn rich red in summer.
Crimson Bottlebrush	*Callistemon citrinus*	Shrub that grows to 3.5 metres with a spread of 2 metres. Red flower spikes grow to 10 centimetres long all year round.
Hardenbergia	*Hardenbergia violacea*	Vine to 1.5 metres tall with pea-shaped flowers that are normally purple, but can be white and all colours in between, that grow in heavy clusters in spring.
Forest Red Gum	*Eucalyptus tereticornis*	Tree to 40 metres high with glossy thick leaves, and yellow flower buds that grow white flowers in spring and summer. Fruits are small, hemispheric horned capsules.
Spiny-headed Mat-rush	*Lomandra longifolia*	Tufted perennial to 1 metre spread and large, bright sword-shaped leaves and a flowering stem that can reach 4 metres.
Weeping Lilly Pilly	*Waterhousea floribunda*	Tree to 30 metres with a height and spread of 4 metres, small bright green leaves and cylindrical golden bronze flowers 40 centimetres long.

Common Name	Botanical Name	Description
Native Olive	*Notelaea longifolia*	Shrub to 8 metres, rough and hairy leaves with red or green leaves appearing winter and spring.
Native Rosemary	*Westringia fruticosa*	Shrub to 2 metres. Small dark green leaves and pink to pinkish purple flowers in loose clusters in spring and summer.
Old Man Saltbush	*Atriplex nummularia*	Grows to 1.5 metres, with greyish green leaves that are very aromatic and star-shaped pink flowers in spring.
Sydney Golden Wattle	*Acacia longifolia*	Shrub to a height and spread of about 2 metres with large, light to deep yellow ball-shaped flowers that appear in branching clusters from winter to summer.
Swamp Paperbark	*Melaleuca ericifolia*	Tree growing to about 15 metres tall, with needle-like bluish green leaves, and brown and red flowers, which both occur in spring.
Sydney Rose	*Boronia serrulata*	Shrub to 1 metre by 1 metre, with fragrant leaves with a smooth upper surface and hairy undersurface. Deep pink flowers appear from winter to spring.
Sydney Red Gum	*Angophora costata*	Tree to 30 metres high and a spread of 10 metres with smooth pink bark,

light green long leaves, fluffy white summer flowers and ribbed woody capsules for fruit.

Eremophila glabra (Emu bush) grows 3 metres high with a 2-metre spread, leathery 20-centimetre leaves and red spring flowers, which then grow long brown seed pods.

Westringia rigida (Coastal rosemary) grows 1 metre, with small, elliptical greyish green leaves; purple flowers occur in spikes from spring to autumn and fruit are small, woody capsules.

Westringia fruticosa (Coastal rosemary) is a shrub growing 1 metre tall and 50 centimetres wide. Small light green leaves with tubular white flowers appear most of the year.

Grevillea rosmarinifolia (Rosemary grevillea) is a shrub growing 2 by 2 metres, with short leaves and clusters of red or yellow flowers in spring and summer.

Northern Territory: From the top to the centre

The Northern Territory has over 4,000 species of native plants, with an extraordinary diversity of regions and climate zones. This vast area boasts everything from mangroves and wetlands to eucalypt forests and tropical savannahs, rocky arid areas, tussocky grasslands and acacia woodlands, right through to sandy deserts. Wow, what a place!

For ease, I break up the Territory into Central Australia, around Alice Springs (Table 11-3), and the Top End in the north (Table 11-4). Central Australia can experience searing heat and freezing cold in the space of a day, while the Top End has huge rainfalls of more than 1,500 millimetres, usually between November and March, with the rest of the year being dry with hardly any rain at all.

Table 11-3 Central Australian Native Plants

Botanical Name	Common Name	Description
Eremophila maculata	Spotted emu bush	Spreading or sometimes upright shrub with grey-green furry leaves and purple flowers with fruits like small unripe tomatoes.
Chenopodium nitrariaceum	Nitre goosefoot	Creeping shrub spreading with small silver-grey leaves, sometimes arrow-shaped. Crimson rosella and grey kangaroos love to eat them.
Acacia victoriae	Elegant wattle	Shrub with a height and width of 3 metres, with small clusters of leaves and yellow ball-shaped flowers in spring to early summer.
Senna artemisioides	Desert cassia	Shrub 2 metres tall, with silvery grey silky foliage and rich yellow flowers with contrasting brown anthers.
Cymbopogon ambiguus	Lemon grass	Spiky, clumping grass with lemon-scented leaves you can eat.
Atriplex nummularia	Old man saltbush	Shrub with a height and width of 3 metres. Grey roundish leaves with inconspicuous flowers that appear year round and fan-shaped seed cases as fruit.
Eucalyptus leucophylla	Bloodwood	Tree to 5 metres, with greyish pink bark and greyish green leaves. The flower buds are reddish and the flowers are yellow, appearing from autumn to spring.

Eucalyptus leucoxylon Yellow gum Tree with a height of 7.5 metres with bluish green leaves and reddish grey flower buds that grow pale yellow flowers in autumn to spring.

Grevillea rosmarinifolia Spreading shrub with a spread and height of 50 centimetres, with long leaves and deep purple tubular flowers that grow through most of the year.

Hakea laurina Sea urchin bush Shrub to 3 metres tall and 2 metres wide, with narrow, smooth leaves and pink, tubular five-petalled flowers in summer.

Acacia baileyana Cootamundra wattle Tree to 4 metres tall, with weeping branches covered in greyish green leaves with golden ball-shaped flowers in spring and summer.

Acacia cyclops Western coastal wattle Shrub to about 3.5 metres with a spread of 2 metres, the leaves are slightly curved and stiff and the flowers are golden rods seen in spring.

Santalum acuminatum Quandong Small tree bearing small plum-like fruit said to be high in vitamin C.

Senna artemisioides Desert cassia Small tree to 2 metres high, with grey-green leaves and yellow flowers.

Carpobrotus rossii Native pigface Creeping plant with a height of 20 centimetres and a spread of 4 metres, with glossy green leaves with a feathery appearance, greenish yellow flowers and bright red berries.

Calytrix tetragona Common fringe myrtle Erect or prostrate decorative shrub from 0.2 to 4 metres high. Tiny white, cream to yellow flowers in autumn to winter.

Triodia irritans Porcupine grass Native spinifex grass that can grow to 2 metres high in some areas.

Hibbertia riparia Erect guinea flower Shrub to 1.5 metres, with simple leaves and purple flowers that turn blue when they dry, flowering anywhere from June to December. Listed as vulnerable in the Territory.

Melaleuca viminea Mallee bell Tree growing to 30 metres high, with stem covered in brown scaly bark, narrow green leaves with a white undersurface, tubular three-lobed flowers and brown hairy fruits.

Eremophila longifolia Berrigan Shrub to 10 metres, with circular leaves and whitish clusters of flowers that grow into reddish berries.

Pandorea pandorana Wonga vine Vine that gets its common name from the screw-like marking around the trunk. It has sword-like leaves with prickly edges and produces fruit as big as your head! A bush tucker plant.

Scaevola aemula Fairy fan flower Spreading branched mounding plant with glossy green leaves. Its flowers are pale to violet and have petals only on one side, a bit like a fan shape.

Callitris columellaris White cypress pine Tree to 4.5 metres high, with pine-like leaves and star-shaped pink to mauve flowers about 2 centimetres across in late autumn to spring.

Queensland: The sunshine state

Queensland has the greatest variety of native plant groups in Australia, with about 40 per cent native to the state, everything from huge tropical rainforest trees to desert plants. Depending where in the state you live, Table 11-5 provides a few natives for your sustainable garden.

Table 11-5 Queensland Native Plants

Botanical Name	Common Name	Description
Alphitonia excelsa	Red ash	Tree to 30 metres, with distinctive light brown rough-skinned oval-shaped fruits.
Atractocarpus fitzalanii		Shrub to small tree with round-ended leaves and small white flowers with

overlapping petals. Brown-yellow foul-tasting edible fruits follow.

Correa alba reaches about 1.5 metres high with 15–25-centimetre inflorescences with rose pink bracts in spring.

Piper novae-hollandiae other common native peppers, with berries a dull orange rather than the usual bright red.

Goodenia ovata 12 metres high by 10 metres wide, although can reach 20 metres, with conspicuous clusters of golden flowers at the end of the branches in summer and autumn.

Anemone hupehensis 1 metre tall, with hairy leaves and beautiful large white five-petalled flowers that overlap, with a yellow centre at the base.

Hibiscus splendens 3 metres by 3 metres with long thin leaves with a hairy underside. Creamy yellow five-petalled flowers in spring.

Banksia integrifolia 1.5–3 metres tall with orange or yellow flowers and saw-toothed grey-green leaves. Grows in sandy soil.

Hymenosporum flavum about 4 metres tall with sickle-shaped leaves and large square flowers with clusters of yellow stamens in the corners.

Eucalyptus leucoxylon gardens, up to about 8 metres, with long cream-white fragrant flowers from spring to autumn. Adaptable.

Hibiscus splendens with glossy green leaves, large white flowers and cream-coloured egg-shaped fruits.

Melicope elleryana attracting tree that usually reaches about 6 metres and has pink flower clusters in summer.

Eucalyptus leucoxylon 8 metres with 15-centimetre leaves and insignificant flowers.

Grevillea robusta ing tree reaching 18–25 metres with dark green leaves almost like fern fronds and golden bottlebrush-like blooms in spring.

Acacia implexa metres, with large spade-shaped leaves and perfumed greenish cream flowers in summer that precede red fruits.

Eucalyptus leucoxylon with large white, pink or crimson flowers above the large glossy foliage.

Acacia implexa rambling shrub with glossy leaves and small orange edible fruits with a flavour like rotten cheese.

Eucalyptus leucoxylon ws to 12 metres high with light green glossy leaves and obvious clusters of red flowers. Beware in some areas, as this is becoming invasive.

Hibiscus splendens 2–5 metres high with small red berries that grow on long spikes.

Eucalyptus leucoxylon can grow to 30 metres high in some cases, with brilliant red clusters of flowers in summer and autumn.

South Australia: The wine state

South Australia includes some of the most arid country in Australia. It is home to a diverse range of native plants and, of the 4,300 or so plants in the wild, nearly 1,200, or 30 per cent, are weeds. All the more reason to plant as many local natives in your sustainable garden as

you can.

Table 11-6 South Australian Native Plants

Common Name	Botanical Name	Description
Austral bugle	*Ajuga australis*	A groundcover growing to a height of 30 centimetres with a spread of 1 metre. The leaves are green with a purple undersurface and the flowers are purple and grow in spring and summer.
Berry saltbush	*Enchylaena tomentosa*	A shrub growing to 50 centimetres high with a spread of 1 metre, with silvery grey leaves and insignificant flowers with flattened red berries.
Blue devil	*Eryngium ovinum*	Grows to 50 centimetres high and wide, with leaves growing in a basal rosette and metallic blue flowers that grow in globose (globe-shaped) heads.
Sandpaper pea	*Daviesia ulicifolia*	A shrub growing to about 2 metres high and 3 metres wide, with leathery light green leaves and dark red pea-shaped flowers that grow in small clusters in winter and early spring.
Common tussock grass	*Poa labillardieri*	A perennial tussock grass 1 metre high and 50 centimetres wide. The flowering stems are long and tussock-forming with plume-like flowers, and the leaves are greyish and narrow.
Creeping kidney weed	*Dichondra repens*	Prostrate groundcover with a height and spread of 1 metre, with light green leaves that grow in a rosette and an erect flowering stem with an orange flower that grows in spring and summer.
Native flax-lily	*Dianella revoluta* var. *revoluta*	This perennial has a height and spread of 1 metre, with deep green leaves and small deep blue flowers with yellow anthers and small blue berries.
Weeping pittosporum	*Pittosporum phillyraeoides*	A tree growing 5 metres tall, with weeping branches covered in narrow silvery grey leaves and pale yellow spherical flowers in autumn to winter.
Golden wattle	*Acacia pycnantha*	A tree growing to 8 metres, with bright green sickle-shaped leaves and spherical golden flowers that grow in spring, summer and autumn.
Cotton bush	*Maireana enchylaenoides*	Grows to 60 centimetres tall, with grey-green felted leaves and golden yellow flowers appearing in clusters mainly in spring and summer.
Silver banksia	*Banksia marginata*	Shrub with a height of 1 metre and spread of 2 metres. Silvery green leaves and crimson to pink flowers grow in clusters in spring to summer.
Wild daisy bush	*Olearia axillaris*	Shrub to 3 metres tall and 2 metres wide, with small wispy foliage and white daisy flowers in summer.
Native hop bush	*Dodonaea viscosa* ssp. *spatulata*	Shrub to 10 metres high, with long narrow leaves and fragrant yellow or cream flowers followed by attractive orangey red seed capsules.
Native wisteria	*Hardenbergia violacea*	Vine growing up to 15 metres high, with purple, white, pink or pale mauve flowers shaped like peas growing in clusters in spring.
Pale flax-lily	*Dianella longifolia*	Tufted perennial with long strappy leaves to 80 centimetres, that forms large clumps. Long sprays of light blue flowers in spring and summer followed by bright blue berries.
Sandalwood	*Santalum acuminatum*	Shrub growing 3 metres tall and spreading 2 metres, with thick pale green leaves and small white flowers that grow small red berries.
Silver banksia	*Banksia marginata*	Shrub to 4 metres high, with blunt oblong or wedge-shaped leaves and cylindrical greenish yellow flowers.
Swainson pea	*Swainsona formosa*	A perennial, this creeping plant has woolly grey leaves and a spectacular head of red pea-shaped flowers with a large spot in the centre that can be black, red or white.

Banksia integrifolia (Coast Banksia) 10 metres tall, with bright green, oval or oblong-shaped prickly leaves and numerous white sweet-scented flowers in summer, followed by heart- or kidney-shaped fruit.

Tasmania: The apple isle

Tasmania is the twenty-sixth largest island on the planet and has a magnificent, relatively unspoiled and diverse environment — everything from tall eucalypt forests to alpine heaths and temperate rainforests. Some of the most ancient plant species in Australia are to be found here.

Table 11-7 Tasmanian Native Plants

Botanical Name	Common Name	Description
Anopterus glandulosus	Tasmanian Laurel	Slow-growing shrub or tree to 6 metres high with 2-metre spread. Small acuminate leaves and white five-petalled flowers tinged with pink in spring, followed by woody fruits.
Banksia marginata	Silver Banksia	Shrub or tree to 10 metres high and wide, with light to deep cream flowers in spring and summer. A critically endangered species in Tasmania.
Athrotaxis cupressoides	Pencil Pine	Slow-growing tree reaching up to 9 metres tall with densely weeping branchlets. Male flowers appear winter to early spring, covering the tree in golden brown anthers.
Brachyscome multifida	Cut-leaved Daisy	Shrub to 2 metres high with greyish green oblong or elliptical leaves and white, blue or purple daisy-like flowers in spring.
Eucalyptus globulus	Tasmanian Blue Gum	Tall tree to 60 metres with long dark green leaves, bell-shaped buds that grow yellow flowers in autumn. Fruit are bell-shaped brown capsules.
Dianella tasmanica	Tasman Flax-lily	Long-lived perennial reaching 30 centimetres high, with narrow grey-green leaves and papery white flowers with yellow centres in spring and early summer.
Melaleuca ericifolia	Swamp Paperbark	Shrub or tree to 8 metres high and spread of 2 metres. Dark green rigid leaves with greenish yellow brush-like flowers in summer.
Bursaria spinosa	Blackthorn	Shrub growing to about 2 metres high and wide, with light green leaves and leaflets, and mauve to pink, pea-shaped flowers that occur in long heads in spring and summer.
Carpobrotus rossii	Native Pigface	Perennial groundcover 20 centimetres high and spreading 50 centimetres, with thick stems, green acuminate leaves and purple daisy-like flowers with a white centre.
Viola hederacea	Native Violet	Small perennial growing to a height of 5 centimetres with a 15-centimetre spread. Rounded, kidney-shaped leaves with tiny, solitary five-petalled lilac to white flowers in spring and summer.
Cupressus macrocarpa	Monterey Cypress	Tree to 18 metres high, with weeping branches covered in short, fine, crowded bluish green leaves that turn reddish bronze in winter. Flowers are either singular or in clusters and hang down with small globular cones.
Banksia marginata	Silver Banksia	Shrub or tree to 2 metres high and wide, with dark green leaves and cream-coloured flowers in summer.
Banksia ericifolia	Heath Banksia	Shrub to 2 metres high and a spread of 2 metres, with small leaves and pink five-petalled flowers in late spring to summer.
Prostanthera rotundifolia	Round-leaved Mint-bush	Shrub to 1.5 metres high and wide, with thick, aromatic rounded leaves and

mauve or violet flowers that grow in heavy clusters in spring.

Blackwood *Acacia melanoxylon* Tall tree to 40 metres tall, with blunt oblong or wedge-shaped leaves, greenish yellow cylindrical flowers in summer to early winter.

Silver wattle *Acacia dealbata* Tree to a height of about 8 metres, with fern-like silvery grey leaves that grow from mealy white bark. The spring flowers are small yellow balls and light brown pods.

Swamp gum *Eucalyptus ovata* Tree to 50 centimetres high and spreading out 2 metres, with dark green narrow leaves and small white flowers in summer.

Tasmanian snowgum *Eucalyptus pauciflora* Tree to 10 metres high, with green glossy leaves and white, six-petalled, bell-shaped flowers and membranous fruit with upturned wings.

Silky tea-tree *Leptospermum lanigerum* Shrub growing 2.5 metres high and 1.5 metres wide with very fine, heath-like leaves and white, profuse and fluffy flowers in summer.

Veined spear-lily *Doryanthes palmeri* Perennial plant growing 60 centimetres high and wide, with flat, glossy green leaves and white flowers with three petals and petal-like sepals in spring to summer.

Victoria: The garden state

Victoria has six geographic regions, each one quite different from the other, from snowfields and wilderness to temperate coastlines. Rich soils abound in most of the regions, supporting a wide range of plant species.

Table 11-8 Victorian Native Plants

Common Name	Botanical Name	Description
Bower spinach	*Pittosporum undulatum*	Shrub to 2 metres by 1 metre, with feathery glossy green leaflets and reddish bronze hop-like fruits that come from inconspicuous flowers.
Coprosma	*Coprosma repens*	Upright spreading plant varying from a dwarf of around 30 centimetres tall to about 2 metres tall. Tiny, spicy lemon-scented leaves, small star-shaped flowers from white to pink in spring.
Correa	*Correa reflexa*	Shrub to 2 metres high by 1 metre wide. Stiff leaves, 1.5 centimetre long, and pink, red or white tubular flowers appearing in winter.
Myoporum	*Myoporum parvifolium*	Prostrate shrub to a height of 50 centimetres and a width of 1 metre, with narrow thick leaves and white flowers with pale lilac spots. Bears fruit in the form of small purple berries in summer.
Weeping boobialla	*Myoporum viscosum*	Dense weeping shrub to 7 metres high and wide, with bright green, dense weeping foliage.
Coast banksia	*Banksia integrifolia*	Shrub to 4 metres high by 1.5 metres wide. Fine heath-like clusters of leaves and small star-like white or pink flowers from winter to summer.
Golden wattle	*Acacia pycnantha*	Shrub to 3 metres, with oblique to oblong small leaves and small fluffy golden balls for flowers in spring and summer.
Golden everlasting daisy	*Bracteantha bracteata*	Perennial daisy, from groundcovers to shrubs 60 centimetres tall. Large, golden papery flowers in spring and summer.
Banksia	*Banksia marginata*	Shrub to 3 metres by 2 metres, with narrow leaves 6 centimetres long and yellowish bronze cylindrical flowers about 18 centimetres occurring in summer and autumn.
Spreading flax-pea	*Gompholobium latifolium*	Shrub to 1 metre high by 2 metres across, with heart-shaped leaves and bright orange and red pea-shaped flowers from late winter.

Scaevola aemula Grows up to 1 metre wide. Bright green leaves and white to pale purple fan-shaped flowers in spring and summer.

Westringia fruticosa Shrub 2 metres high with a 2-metre spread. Bushy with aromatic stems that grow blunt, flat leaves. Tubular flowers grow in spring and appear purple, white or pink.

Atriplex nummularia Grows to 3 metres, with large grey to silvery leaves covered in a scaly white layer. Separate clusters of male and female flowers. Very adaptable.

Hakea laurina Shrub 3 metres high, with prickly needle-like leaves and white flowers tinged with pink during winter and spring. Attractive woody fruits.

Eucalyptus sideroxylon Tree 20 metres high with reddish bark, bluish grey long leaves, and bluish grey flower buds that bear pink to red flowers in early spring.

Scaevola crassifolia Shrub growing to about 1 metre by 1 metre, with narrow long leaves and pink star-shaped flowers in spring.

Hibbertia scandens Grows only 20 centimetres high but with a 2.5-metre spread, with glossy, bright green leaves and golden five-petalled flowers in summer.

Grevillea rosmarinifolia Shrub 2 metres high and wide, with soft, light green oval-shaped leaves and pink, red or yellow tubular flowers.

Templetonia retusa Shrub 3 metres high, with small rounded leaves, masses of papery, pink nodding flowers with small red dots in spring and early summer.

Dodonaea viscosa Grows to 3 metres, with shiny, sticky leaves and large, papery reddish fruits in spring and summer.

Acacia ligulata Shrub 3 metres high with smoky-grey to blue leaves and dull red narrow flowers that bloom throughout the year.

Western Australia: The wildflower state

Western Australia is a vast state that takes up 252,525,500 square kilometres of Australia. That's the entire western third of the country! Although much of the state has poor soils, it has nearly 10,000 different native plant species, including many that put on fabulous floral shows after rain.

Table 11-9 Western Australian Native Plants

Botanical Name	Description
Banksia grandis	Grows up to 4 metres high and 2 metres wide. Dark green smooth leaves and orange spring flowers.
Grevillea wickhamii	Shrub 2 metres high with a spread of 2 metres. The oblong spiked flowers are glowing shades of bronze and ruby red in spring and early summer.
Leschenaultia biloba	Dense, rounded shrub with a height and spread of 1 metre. Dark green leaves and white trumpet-shaped flowers in clusters in summer.
Anigozanthos manglesii	Grows to 3 metres, with dense, open spreading branches and globular flowers at the end.
Melaleuca huegelii	Shrub growing to 1.5 metres high and 2 metres wide, with tiny rounded leaves and orange-red bottlebrush-like flowers in spring and summer.

Griselinia littoralis Shrub or tree to a height of 2.5 metres and spread of 4 metres, narrow light green leaves and red, pink or cream-coloured five-petalled flowers that grow in spring and summer.

Hebe pinguifolia Shrub to 2 metres high and wide, with silvery grey soft leaves and dense, red spring flowers.

Leucophyta brownii Compact shrub to height and spread of 50 centimetres. White woolly leaves and, in spring, yellow bell-shaped flowers appear in clusters of 10 to 20.

Lophomyrtus bullata Shrub to 3 metres high and spreading 2 metres, with narrow bright green leaves and large, lilac trumpet-shaped flowers with hibiscus-like throats in late spring and summer.

Olearia paniculata Shrub or tree to 2 metres high and 1.5 metres wide, with flowers that are large yellow heads surrounded by long bracts in autumn and winter.

Pimelea prostrata Shrub to 1 metre high and wide, with purplish pink, dense cylindrical spikes for flowers in winter to summer.

Pittosporum tenuifolium 'Tom Thumb' Compact shrub to a height and spread of 1 metre. The flowering stem is tall and erect with bright green strap-like leaves and red and green clusters of flowers.

Sophora microphylla 'Dragon's Gold' Shrub or tree to 4 metres high and 2 metres wide, with rounded leathery leaves and grey and scarlet flowers occurring in short broad spikes in spring and summer.

Sophora tetraptera Small tree to 3.5 metres tall and spreading 3 metres with rust-coloured bark and pale green leaves. Cream flowers occur in loose heads in summer.

Veronica pinguifolia 'Mrs Winder' Shrub to 60 centimetres high with a spread of 1.5 metres. Narrow stiff leaves and pink or mauve flowers in summer.

Veronica tetrasticha Shrub to height and spread of 60 centimetres. Tiny heath-like leaves and white daisy-like flowers with pink or orange centres in spring.

Weinmannia racemosa Tree to a height of 12.5 metres and a spread of 2 metres. Straight leaves and clusters of white five-petalled spring flowers.

Xeronema callistemon Shrub to a height of 2.5 metres with a spread of 2 metres. Leaves are small and the flowers are large, spherical golden balls appearing in spring.

Myrsine divaricata Shrub to 1 metre high and spreading 1.5 metres, with slender, lacy weeping branches and soft narrow leaves. The flowers are white to deep pink with five petals, from winter to spring.

Astelia chathamica 'Silver Spear' Tussock to 1.5 metres tall and 1 metre wide, with narrow leaves and red and green pendant flowers in spring.

New Zealand Climate-Friendly Performers

At least 84 per cent of the native plant species of New Zealand occur nowhere else in the world. Some of the most beautiful and unusual New Zealand natives are ideal for your sustainable garden. By using native plants or a mixture of native and exotic plants, you not only help to preserve some of these rare and endangered plant species,

you also create the right habitat for tui, geckos, wetta and all manner of creatures that make this land special. You also help to rid the country of weeds by planting natives to replace them or crowd them out. Do your bit to preserve New Zealand's natural heritage by planting native plants to encourage native wildlife.

Table 11-10 provides a sample of New Zealand native plants to consider. Remember that some may have different common names from the ones I've used here, due to regional differences. Although it's best to stick to the botanical names, if possible, I've listed these plants alphabetically according to common name, in case they're the only ones you know, so you should be able to find the correct botanical name.

Table 11-10 New Zealand Native Plants

Botanical Name	Common Name
Cordyline australis	Cabbage tree; 5–10 metres tall, with tufts of long green leaves at the end of every branch, where cream-coloured flowers open in late spring and early summer.
Geranium traversii	Geranium; a perennial, with thick green leaves and a long flowering spike that can last many months, with medium-sized white to pink flowers in summer to early autumn.
Coprosma repens	Coprosma; 2–3 metres tall with a spread of 1 metre, with almost orange branches and delicate green leaves.
Pittosporum tenuifolium	Kohuhu; a spreading shrub or tree, 3–6 metres tall, with dark purple to black leaves and dark purple flowers in spring.
Hebe cultivars	Hebe; compact, slightly fleshy-leaved shrubs that come in a huge range of sizes, foliage, flower colour and flowering times. There is a hebe to suit every occasion.
Clianthus puniceus	Kaka beak; a fleshy-leaved plant can grow to 6 metres tall, with attractive red flowers that are said to resemble the beak of a kaka bird.
Kunzea ericoides	Kanuka; a tree, 3–6 metres tall, with pale orange bark, and thin leaves with a pale underside. The flowers are deep purple and form on the bare branches in spring then form small dark purple to black berries.
Sophora microphylla	Kowhai; 10 metres high, with delicate foliage made up of tiny leaflets that normally drop in early spring as the bright yellow hanging flowers come out.
Leptospermum scoparium	Manuka; 2–5 metres high, with small prickly leaves and white or pink flowers that grow in September and June.
Metrosideros excelsa	Pohutukawa; up to 15 metres tall, with dark grey-green foliage that contrasts with light grey bark and pink to deep red flowers in late spring to summer.
Pseudopanax lessonii	Lancewood; 4–5 metres tall and 3–4 metres wide, with large, thick glossy leaves and inconspicuous flowers that later grow small dark purple fruits on the female plants.
Griselinia littoralis	Broadleaf; 4–6 metres tall and 2–3 metres wide, with thick, glossy dark green leaves and inconspicuous flowers that grow black fruits on the female plants.
Dacrycarpus dacrydioides	Kahikatea; 30 metres, plus tree has weeping branches with olive green needle-like foliage.
Selaginella kraussiana	Selaginella; a fern-like mat of grass-green mould that looks similar to moss and covers approximately 1 metre.

Selliera radicans: A creeping plant that looks like short bright green grass until it flowers in late spring to autumn, the flowers being small and white.

Muehlenbeckia astonii: Shrubby vines, with dense branches covered in small heart-shaped leaves and delicate white flowers forming in summer, followed by small black seeds.

Cyathea dealbata: Tree fern trunk, with long (up to 5 metres) green fern fronds with the signature shiny silver underside.

Griselinia littoralis: Small tree, with small, dark green glossy leaves and small white flowers that cover the plant in summer.

Pseudopanax crassifolius: Young plants in juvenile form, when its leaves are like a toothed saw, as it grows, the tree completely changes appearance. Its trunk turns grey and looks like thick twisted rope. Can grow 5 metres tall.

Coprosma repens: Shrub to small tree, 1–3 metres tall, with very densely packed darkish green leaves that vary in shape, and bright yellow flowers that grow into red or yellow fruit and can hang in the tree for months.

Chapter 12

Vegies and Herbs, Fruit and Nuts

In This Chapter

- Considering your garden space
- Deciding on the type of food garden to grow
- Talking fruit and nut trees
- Providing for your needs
- Keeping a weather-eye on the seasons

The ability to grow staples such as vegies, herbs, fruit and nuts sounds very satisfying (makes me hungry just thinking about the yummy produce) but is, at the same time, a daunting undertaking.

In this chapter I guide you through the whole process, from planning for effective garden space that is productively utilised, to choosing the right product for your space, nurturing it through to fruiting time and then reaping the harvest.

Growing produce is a huge process, but a lot of it takes care of itself. Plants and trees are governed by forces you have no control over — basically the seasons and weather conditions. Plants and trees do what they're programmed to do, and that is to produce fruit that contains seed to ensure the survival of the species.

What you, as a producer, can assist with is the health and wellbeing of the plants by providing the optimum growing conditions to assist the plants with maximum fruit production.

Using Your Space Wisely

What you are able to plant is governed by the amount of space available to you and how much of that space you want to give over to food production, rather than using it for an area of lawn, the clothesline or the basketball ring.

You may decide that your need for a sustainable food garden surpasses many other purposes your garden may have had. Existing plants or trees in your garden may not be as desirable, or maybe they're not serving any purpose, so you may decide to remove them. Most people have something in their garden that's not really ideal, but for one reason or another it has stayed there — perhaps it's too hard to dig out, too tricky to chop down, or you've just got used to it being there.

Gardens are a bit like household furniture. You don't necessarily have to go out and buy new stuff, just move or reconfigure existing pieces to change the feel of the space. You probably have a lot more space than you think, and can change your existing garden space and how it is used very easily.

Traditionally, garden beds follow fencelines, using straight lines or minimal curving of the edges. Vegie beds and fruit trees are usually away from the house at the rear of the property. But you can break free from those traditions and create lovely flowing lines. Your herbs and vegies can intersperse flowering plants, right near the back door so you can harvest them easily, if you like, and fruit trees can provide a shady grove or be scattered among your shrubs. Refer to Chapters 4 and 5 for more on garden design.

Three important elements govern the success of your vegie garden or orchard:

- **Chill factor:** Some fruit and nut trees, such as apples and hazelnuts, have a chilling requirement. This means that the tree must have a certain number of hours per year when the temperature is below 7 degrees Celsius in order to set fruit. I talk more about the chill factor in the section 'Choosing fruit and nut trees' later in this chapter.

- **Pollinators:** Some fruit trees and vegies need pollinators in order to bear fruit or produce vegetables. Pumpkins, kiwi fruit and pear trees, to name a few, require pollinators. And that means bees! Think back to primary school science lessons about bees collecting nectar to make honey; they also transfer pollen from male to female flowers, thus fertilising the plants.

- **Sunlight hours:** Sunlight hours refers to the amount of sunlight

each area of your garden receives each day. Vegetables and fruit trees require full sun for most of the day to fruit; that is, at least six or seven hours of sunlight per day.

Ideally, you need to reserve the sunniest part of your garden for the vegies and fruit trees, and that means taking note of the direction and height of the sun as it passes east to west, remembering that this changes with the seasons.

Deciding How to Grow Your Garden

When most people think about growing fruit and vegetables, they usually think of the traditional vegie patch, with rows of tomatoes and lettuce, or cabbages and carrots, maybe a trellis for beans, peas and passionfruit, and a couple of rows of fruit trees nearby. And that's certainly an option. But you're actually spoiled for choice in how you can grow your fruit and vegies. You can even buy miniature fruit trees and pot them up, or find an old tub for your spuds.

For those gardeners who have the space, garden beds are great. Garden beds can take a number of different forms, from the get-your-back-into-it dug-over patch to the no-dig variety, from raised beds and bale beds to planting your vegies throughout the rest of your garden.

Containing your plants

Containers are great for growing fruit trees, herbs and vegetables because they can be as small or large as you like, within reason. They're great because they're:

- Manageable, perfect for people who are very busy, have a disability or are elderly, because they require very little maintenance. Containers require minimal mulching and generally no weeding, use less water than a garden bed, because you're only watering the plant in the pot, and are often located quite close to the house. Unlike a vegie garden that may be right down the end of the yard.

- Perfect for those people with no backyard or only a small area in which to garden.

- Portable, depending on their size, of course.
- Versatile, lending themselves to many horticultural uses.

And, as long as the container is at least 30 centimetres deep and has drainage holes, the plants have ample room to spread their roots and thrive. See Chapter 14 for more tips on container gardening.

Containers can also be a very sustainable way to grow your fruit trees and vegies because you can reuse all sorts of different things to make your garden. The only thing you need to keep in mind is whether the container is suited to the plant you want to put in there. For example, a miniature fruit tree needs a deeper and wider container than a tomato does. Here are some creative examples of container gardening:

- Head down to your local tyre shop and ask the salesperson if he has any old tyres out the back that you can have. Big tractor tyres are the best. When you've worked out how to get the tyre back to your house, just place it in the right spot in your garden (not the best for a balcony) and you have a ready-made garden. You can fill it in the no-dig style (see 'No-dig garden beds' later in this chapter) or fill it with topsoil and organic matter. Smaller car tyres can be used either singly or placed one on top of the other, depending on how deep you want the bed to be. Tyre stacking is a very effective way of growing your potato crop. I do this all the time, although some people are concerned about chemicals from the rubber leaching into the soil. If you're worried about it, don't use them.

- Find yourself an old bath or laundry tub and locate it in a sunny spot in your garden. If you're feeling really energetic you can dig a hole for the tub to sit in so it's at ground level. Here are some options for what to put into the tub:

    - You can fill the tub with a mix of soil and humus, and plant herbs or vegies, beans, a quick crop of Asian greens or cherry tomatoes. (Make sure the plughole is free-draining.)
    - You could try something more exotic, such as water chestnuts (*Eleocharis dulcis*), water celery (*Oenanthe javanica*) or arrowhead (*Sagittaria sagittifolia*). For these plants, make sure that the plughole is blocked up because they actually grow in water. You also need to provide a rich media base of soil enriched with organic matter and coarse sand.

Old wheelbarrows also make great vegie beds for shallow-rooted vegetables like radishes or lettuce and some of the Asian greens. If the wheelbarrow is still usable it can be moved around the yard to capture as much of the sun as possible.

Going for the traditional vegie patch

A good size vegie patch to start with is about 1.5 metres wide by about 3 metres long. This is quite a manageable size and should produce plenty of what you need for your family initially. As time goes on and you reap more of what you sow, you're likely to become more and more addicted to growing your own vegies and rapidly expand your patch as you become interested in different varieties of tomatoes, intrigued with purple-coloured beans and consumed with rabbit food, meaning the many types of delicious lettuce you can grow!

Anyway, I'm rabbiting on. Here are some steps to create your vegie garden:

1. **Mark out the bed.**

   Hammer in some stakes to mark the corners of the bed and use a string line between them. Now the hard work starts — this type of bed is for the more energetic gardeners.

2. **Grab your spade and dig over the entire area, removing any weeds as you go.**

   The soil must be dug over to a depth of about 30 centimetres to allow the vegie seedlings the best chance of survival.

3. **Cover the dug-over soil with aged animal manure — horse, cow, sheep or goat. Chook poo is a bit too concentrated.**

   You need about 10 centimetres of manure, which you need to dig in well.

4. **Give the area a good watering and cover with dry mulch, such as pea straw, sugar cane mulch or straw.**

All you need to do now is decide what you'd like to plant in the vegie bed. Ask everyone in the family what their favourite vegie is and then check if it's the right time of year to plant that vegie. If it is, head down to your local garden centre and get some seedlings or seeds. When you get home, sit down and have a good read of the directions

for planting. The directions should be informative and give you ideal spacings between the seedlings or seeds and the depth you should plant them. Best of all, they also tell you when you can expect to harvest and consume your deliciously fresh crop!

No-dig garden beds (sounds perfect to me!)

No-dig garden beds are exactly that — no digging required! They use a layering process of materials that break down over time to produce a rich soil, along the lines of sheet mulching in permaculture (see Chapter 16). The beauty of the no-dig garden bed is that it doesn't matter how poor your soil is, whether it be rocky, clayey or sandy, because you're building your garden on top of your existing ground. However, you need to be ahead of the seasons here because a no-dig bed, ideally, should not be planted into immediately. The rich organic matter needs a chance to break down to turn into the rich soil you want for your vegies. If you construct your no-dig bed in late summer or autumn, it will be perfect for planting in spring.

To make a no-dig garden bed, check out Figure 12-1 and follow these steps:

1. **Mark out the area for the bed in late summer or autumn.**
2. **Mow the area, leaving the clippings there as mulch.**
3. **Wet the entire area.**
4. **Start building up layers of different materials.**

   Start with a layer of wetted newspaper about 5 millimetres thick, or one layer of carpet or cardboard, making sure the pieces overlap so that weeds don't grow through.

5. **Lay out edging or paths with bricks or timber to a height of 20–25 centimetres.**

   This is not essential, but depends on the overall effect you want to create. The bed will subside to this depth over a short time.

6. **Toss on any organic waste to a depth of about 10 centimetres.**

   Use waste such as grass clippings, lucerne hay, vegetable scraps and compost, and then give a light watering.

7. **Cover with 10–15 centimetres of rotted manure, humus from your compost or mushroom compost (refer to Chapter 9).**

Manure from horses, cows, sheep or goats are great soil conditioners and help break everything down to form a rich soil.

8. Add a layer of mulch, such as pea straw or sugar cane mulch, to a depth of about 20 centimetres.

9. Lightly spread more manure (about 2 centimetres) and water.

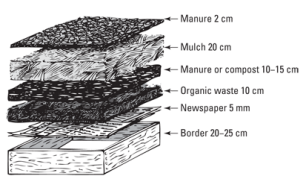
10. Come spring, enjoy planting your vegie seedlings into a rich organic and potentially fertile soil, and watch 'em thrive!

What a fabulous way to start a vegie garden! In fact, the whole process actually improves the original ground because worms and microorganisms rush to the raised bed in droves, breaking the organic matter down and assisting the improvement of the native soil. You actually create a compost to grow your vegies in.

Ideally, plant seedlings and shallow-rooted vegies like broccoli, cucumbers and lettuces in the raised garden bed first, rather than directly sowing seeds, because the density of the soil will still be forming. You can add some flowering annuals, like nasturtiums, or herbs to attract bees and other beneficial bugs as well.

Over time, the bed will break down because the worms constantly work the soil for you. So don't forget to top the bed up with more organic matter from time to time. Check out Chapter 10 for more on worms.

Figure 12-1: No-dig beds are built in layers on top of the existing soil.



Raised garden beds

The raised bed is similar in some ways to the no-dig garden bed, except that it's more formalised. Raised garden beds are constructed to a height to suit you and are terrific for elderly people or anyone

who has trouble bending. And, they're perfect if you suffer with a bad back. If built to the correct height they are also accessible to people in wheelchairs. Raised garden beds can be constructed from a variety of materials:

- **Bricks:** Old bricks can often be purchased very cheaply. They may require a bit of a scrub with a wire brush, but will give a delightful rustic touch to your garden. If they're more than three bricks high, mortaring them in to help keep them stable is a good idea.

- **Timber sleepers:** These also make a fabulous and sturdy raised garden bed. First work out where you want the bed to be. Try to make the bed the size of the sleepers, so you won't have to cut them. Lay them on their narrow side and either bolt them together using coach bolts or screws, or driving pegs into the ground flush against the sleepers to hold them upright. Which method of fastening them in place you choose depends on how high you want to go. A bed three sleepers high or more needs to be bolted together.

- **Rocks:** You can sometimes salvage unwanted rocks from farmers, or even from your own property. Use these for low edging; if you want to build your bed high, you need some expertise in dry-stone walling or you need to mortar them together.

- **Corrugated iron:** Use old corrugated-iron sheets and secure with star pickets and wire. Make sure that the edges aren't sharp by forming a lip on the top edge. They will eventually rust out, but it will take some time.

- **Galvanised iron or Colorbond tanks:** These gardens can be purchased ready-made in a variety of sizes, shapes, heights and gorgeous colours. Ask about them at your local garden centre or check some out online at `www.sgaonline.org.au` (look under the Info Pages for Yummy Yards), `http://td-rainwatertanks.com.au` (select Garden Beds from the left-hand menu) or `www.birdiesgardenproducts.com.au`.

Some pine is treated with nasty chemicals that can leach into the soil and so is not recommended for use as a frame for raised

vegetable garden beds. Check with your supplier.

When the raised bed is in place, all you then have to do is fill it up. You can buy some garden topsoil from your garden centre, add a layer of well-rotted manure or other organic matter, top with a pea straw or sugar cane mulch and start planting.

If you decide to build a raised garden bed, Table 12-1 gives some suggested measurements that may be useful.

Table 12-1 Suggested Measurements for Raised Beds

Height or Width	Reason
75–90 cm high	For people standing
60 cm high	For people sitting
30–60 cm wide	Access from one side only
Across wide	Access from both sides

Straw bale beds

Straw bale beds are an interesting way to set up a raised vegie garden. Instead of using sleepers, bricks or iron, you use straw bales as the border. Fill the space inside the straw bales with topsoil, a layer of rotted manure or other organic matter and top up with a dry mulch. The straw bales also provide you with comfortable seating while you plant out, weed, water and harvest. Don't use straw bales for a bed at standing height, however, as they're too unstable to stack.

Naturally these bales won't be a permanent fixture in your garden because they continually break down, encouraging healthy soil organisms to inhabit your vegie plot so the worms will arrive in droves. However, your seating may eventually, after one or two seasons, need replacing because it is sagging and wet. The bonus is that the bales can be broken up and used as mulch for your vegie garden or added to your compost. Simply replace the old bales with new ones. You couldn't get anything more sustainable than that!

Straw bales can also be used individually to plant out vegies. The only drawback with this method is that you need to use quite a bit more water than for other methods. When you've lugged your straw bales home, make sure you put them exactly where you want them, because they end up being very hard to shift after they've become wet!

To use individual bales as garden beds, rather than as a border, you first need to prepare them. After you've positioned them, thoroughly

water them two or three times a day for about a week. This starts the decomposing process, gets the good bugs activated and begins to provide a more soil-like environment for your seedlings. If you want to speed up this process, sprinkle a handful of blood and bone over the bales. Then water with your own liquid fertiliser made from chook poo or worm wee, or give them a commercial liquid feed.

After a week your bale is ready for some vegie seedlings. Ideal vegies to plant are salad greens, lots of mixed lettuce, Asian greens, cucumbers and cherry tomatoes. Root vegetables like carrots or beetroot don't really work. Herbs, such as parsley, coriander and basil, grow beautifully in a straw bale bed.

When you have your seedlings and are ready to plant them out here is what you do:

1. **Have your wheelbarrow full of rich humus from your compost mixed with some soil or other organic matter.**
2. **Using a little trowel, make some holes along the length of the bale, enough to hold what a 600-millimetre pot would hold.**
3. **Fill these holes with your compost mix.**
4. **Carefully plant a vegie seedling into each hole.**
5. **Water the seedlings in and watch them thrive!**

Take care to ensure that water is kept up to the vegies and that you apply liquid fertiliser every fortnight, because initially the straw bales don't retain the moisture quite as well as your soil, although after a period of time they hold water very well.

After you harvest your vegies, you can break up the straw bales with a garden fork and spread them over other areas as a very vibrant and nutritious mulch, or incorporate them into your compost.

Incorporated vegies, or pottager gardens

You don't have to have a bed for your vegies at all! You can incorporate your vegetables into your existing garden beds. By planting them out among other plants in the garden you create a pottager garden — traditionally a mixed garden of herbs, vegies, and fruiting, flowering and ornamental plants. Your existing shrub or flower beds undoubtedly have spaces between the plants that you can fill up with some vegies, like leeks, cabbages, broccoli, garlic and

silverbeet. Avoid vine-type plants such as pumpkins, as they smother the other plants.

Vegies, because of their shape and form, add different textures and colours to the garden. Also, the bad bugs are totally confused because they don't know where the vegies are — they don't expect them to be among the shrubbery! The beneficial insects are there though, as are the bees, because the flowers in your garden bed attract them.

A pottager garden is a little like a permaculture garden (see Chapter 16 for more information on permaculture), which uses companion planting (also called guild planting) to benefit the plants. Chapter 8 also discusses companion planting.

If you want height in a garden bed, instead of planting an ornamental tree, plant a fruit tree or a nut tree. Fruit and nut trees come in all shapes and sizes today. See the next section for more on trees.

Fitting Trees into Your Backyard

Imagine simply walking out into your garden and picking fresh, delicious fruit or nuts straight from your own trees! Not to mention the shade they provide.

Fruit trees are *deciduous*, which means that in summer they can provide lovely cool shade and can be used in a variety of ways:

- Planting fruit trees close to the house provides summer shade, but lets in winter sun.
- If you have chooks, planting a fruit tree in their yard or just outside the fence provides shade for the chickens in summer. And the chickens provide lots of chook poo for the tree so it will thrive.
- Planting a nice citrus tree next to the pergola or barbeque area, or anywhere you're likely to sit on a warm summer's day to read or entertain, gives you a perfect spot to enjoy the peace and

coolness it provides.

Training your trees

If you have an existing garden bed on a fenceline, consider planting espaliered fruit trees. An *espaliered* tree is one that has had its front and rear branches removed and is trained to only grow branches to the side. So the tree is very flat and the side branches are trained along wires that have been attached to a fence or wall. If an unwanted branch starts to grow, you either remove it or train it along the wire. Espaliered fruit trees look great on a fence and still produce an abundance of fruit.

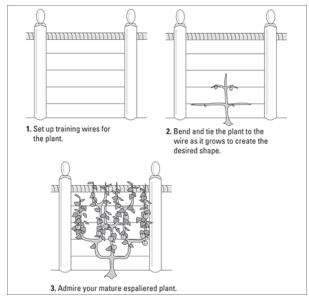
You can actually espalier fruit trees when they're in containers. Just place the pot against your fence or the wall of your house, attach some trellis to the fence or wall and start training the tree. I've seen cumquat and mandarins trained like this and they look gorgeous. Apples, pears, plums, peaches, nectarines and grapevines do equally well.

To set up the espaliered tree, you need to attach three or four horizontal lines of sturdy wire onto the fence or wall. The first wire should be between 30 and 45 centimetres above the soil and the remaining horizontal wires should be at 30-centimetre intervals up to a height of about 1.5 metres. The wire line should run for up to 1.5 metres either side of the tree, so about a 3-metre length is needed for each horizontal line. Ensure that the wire is held securely, because a tree branch can be quite heavy, particularly when it's laden with delicious fruit!

Figure 12-2 shows a simple design for an espaliered tree; however, many other designs can be used. When buying your tree, if you're uncertain, ask an experienced garden centre salesperson for advice. Generally for espaliered trees you need something that doesn't have too many branches. Have a really good look at the shape of the tree to see if it has two branches at the bottom that could easily be trained along either side of the bottom wire.

Bear in mind that you need to cut off the leader shoot or trunk above the next two or three growing buds, which form next year's branches for the second and third wire. Espaliers are a bit of work in the growing season because they don't always grow where you want them to, so they need constant trimming, but you have to prune fruit trees anyway!

Figure 12-2: Espaliered fruit trees are a great way to use limited space, especially along a fence or wall.


1. Set up training wires for the plant.
2. Bend and tie the plant to the wire as it grows to create the desired shape.
3. Admire your mature espaliered plant.

Espaliered fruit trees have several advantages, such as:

- They save space in your yard.
- Their fruit is attractively displayed.
- The fruit is easy to harvest because it is highly visible.
- Pruning and any other treatments are simplified because of easy access.
- They bear fruit earlier in the season.
- You can place them between 2 and 4 metres apart. If you have a long fenceline, you could produce a lot of fruit!

Two for one, or try a fruit salad

Another great space-saving idea is to plant multigrafts. *Multigrafts* are a single tree with two or three different varieties of the same species growing from a shared trunk. Examples include an apple tree with both 'Granny Smith' and 'Pink Lady' apples, a citrus growing both oranges and lemons, and the 'Fruit Salad' tree, bearing up to eight different fruits! Multigrafting alleviates the problem of locating a cross-pollinator, because varieties are chosen that can pollinate each other.

Grafting is a method of plant propagation. The tissue of one plant is fused with the tissue of another plant of the same species. The bottom half of the plant is called the *rootstock* and is generally a vigorous, proven performer. The top half, called the *scion*, is the plant that you actually want. They are bound together using horticultural grafting tape and allowed to fuse. Correct adhesion takes a number of months depending on the plant species.

Four types of 'Fruit Salad' tree have been developed — a citrus, a stonefruit, an apple tree and a nashi pear tree. These unusual and special trees were developed by the West family in New South Wales. How innovative!

You can buy these trees at your local nursery or garden centre or be adventurous and graft your own. Numerous websites give you advice on grafting.

A really simple way to have an orchard in a small space is to plant two or three fruit trees in the same hole. The best varieties to do this with are apricots, nectarines, peaches, plums, cherries, almonds, apples and pears. This also solves the problem of cross-pollination and you get more fruit for a longer period. Make sure that you always plant compatible fruit types in the one hole. For example, two or more cherries, two or more pears or two or more apples. Don't mix up your fruits in the one hole.

Baring all

Fruit and nut trees are often purchased as *bare-rooted stock*, which are small trees that have their root systems carefully cushioned in some sawdust or a similar moist medium and wrapped in plastic. They're usually grafted trees, but not always.

When you get your tree home you need to plant it fairly quickly to prevent the root system drying out. Here are some simple steps to follow to ensure your tree is successfully planted (see Figure 12-3 for a diagram):

1. **Dig a hole about twice the size of the root ball and 'rough up'**

the sides a little.

Don't dig too deep because the tree has to be the same height above ground level as it was previously.

2. Make a mound, like a little hill, using existing soil or a mix of soil and 20 per cent compost, in the middle of the hole.

3. Remove the plastic from the roots and gently tease them out.

4. Place the tree over the centre of the mound, allowing the roots to drape evenly over the mound.

5. Backfill the hole, keeping the graft about 10 centimetres above the soil.

As you fill, gently move the tree a little to remove any air pockets.

6. Water the tree in and lightly prune each branch to just above a bud about 30 centimetres from the trunk.

7. Stake the tree if you feel it needs greater stability.

Bear in mind, though, that a slight amount of trunk movement is beneficial to the tree as it promotes growth and resilience.

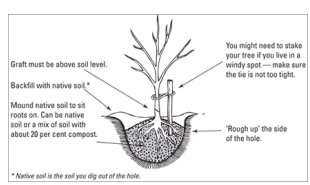

Graft must be above soil level.
Backfill with native soil.*
Mound native soil to sit roots on. Can be native soil or a mix of soil with about 20 per cent compost.
You might need to stake your tree if you live in a windy spot — make sure the tie is not too tight.
'Rough up' the side of the hole.
* Native soil is the soil you dig out of the hole.

Figure 12-3: Fruit and nut trees are often bought as bare-rooted stock, with the root ball encased in a soft medium, which requires care when planting.

Choosing fruit and nut trees

So many different types and forms of fruit and nut trees are available these days, knowing where to start in choosing which trees to plant can be difficult. Here are a few things to consider:

- Decide on the types of fruit and nuts you and your family like to eat and prioritise the ones you want the most.

- Work out how much fruit you actually eat.
- If you have a surplus, think about what you will do with it.
- Think about the space you have available, to help decide on appropriate trees.

The taller the fruit tree, the more need you have of a ladder to harvest your fruit, and the greater chance you have of falling off it. Keeping fruit trees small makes sense, as they are more manageable and safer!

Following are some of the more popular fruit and nut trees you can choose from, with a few handy hints for propagating and caring for the trees to ensure the best chance of producing good fruit.

Apples and stonefruits

Apple trees are ever-popular, especially in cooler climates. They need good drainage so, if you have a heavy clay soil, you need to mound the area up to successfully accommodate your apple tree. Apple trees also have a chilling requirement, which varies depending on the type of apple, ranging from 300 to 1,200 hours per year at below 7 degrees Celsius. Varieties such as 'Pink Lady', 'Golden Delicious', 'Sundowner' and 'Granny Smith' are suitable for warmer areas because their chilling requirement is at the lower end of the range.

In Australia, apple growing has greater success in the south, due to lower temperatures over the winter period. New Zealand has even lower temperatures again, during autumn, winter and early spring.

Chilling refers to the number of cool-temperature hours the tree needs to break the dormancy period and produce fruit. Many varieties of fruit tree require 1,000 to 2,000 hours of temperatures lower than 7 degrees Celsius in order for the flowering buds to mature properly through the winter months. The low- and medium-chill apples listed in Table 12-2 like a milder winter with a long hot summer and a long mild autumn, and so are suitable for most areas in New South Wales and some parts of southern Queensland. If you want to find out more about apples and stonefruits suitable to your area,

contact your local nursery or garden centre.

Table 12-2 Chill Factors for Various Fruit and Nut Trees

Type of Tree	Chill Factor per Annum (below 7°C)
Apples	
'Anna'	200–300 hours
'Beauty of Bath'	200–400 hours
'Cox's Orange Pippin'	600 hours
'Golden Delicious'	700 hours
'Granny Smith'	800–1000 hours
Nectarines	
'Goldmine'	400 hours – medium chill
'Mayglo'	500 hours – medium chill
'Nectarose'	150–300 hours
Peaches	
'Dixired'	700 hours – high chill
'Early Grande'	150–300 hours
'Flamecrest'	600 hours
Plums, European	
'Angeleno', 'Green Gage'	700–1000 hours
Plums, Japanese	
'Burbank', 'Fortune', 'Mariposa', 'Purple King', 'Santa Rosa', 'Shiro'	800 hours

A clever nurseryman not that many years ago twigged to the fact that some people would dearly love to have an apple tree in their backyard but simply don't have the space for one. So he went off to his horticultural science lab and 'invented' the dwarf apple tree!

Dwarf apple and other dwarf fruit trees are grafted species of trees with a small habit (refer to the section 'Two for one, or try a fruit salad' earlier in this chapter for more on grafting). The rootstock is usually a healthy and vigorous species with another desirable species of apple, nectarine or peach grafted onto it. Trees reach approximately 2 metres by 2 metres and are perfect for small areas or even containers. They produce an abundance of fruit, require less pruning and are available in a number of varieties, including the apple varieties 'Granny Smith', 'Golden Delicious' and 'Jonathon'.

Some varieties have a double graft or multigraft, which means that you can grow more than one type of fruit on that particular tree. Amazing isn't it? I have a double-grafted apple tree in my backyard. It's little at the moment so I can't rave about its fruiting

yet, but I'm sure in the future I will. It will eventually grow 'Granny Smith' and 'Pink Lady' apples! I've been told by a reliable source that the 'Granny Smith' may try to dominate the whole tree so that side of the tree will need to be pruned more heavily than the 'Pink Lady' side in order to achieve a balance.

Dominance can be avoided completely by using a totally different method called *duo* or *trio planting*, with two or three fruit trees planted into the same hole. The beauty of this method is that you still get different types of apples but no one tree will dominate, and you'll also have a greater chance of cross-pollination.

One compact *cultivar* (a cultivated variety of a plant), going by the pretty name of the 'Ballerina' apple, grows only 1.5 metres tall by about 60 centimetres wide and produces a healthy crop of medium- to large-sized apples in mid to late March. Best of all, they have a delicious flavour. Some varieties of 'Ballerina' apple don't need a pollinator and some are only partially self-fertile, so having another one in the yard may be a good idea. 'Granny Smith' or 'Jonathon' also pollinate most varieties of 'Ballerina' apple. Check with your local nursery. The Flemings Trees website (www.flemings.com.au) also has lots of valuable information.

Peaches, apricots and nectarines are delicious summer fruits to enjoy and every garden should have one of each. Peaches and nectarines also have miniature cultivars that grow to approximately 1.5 metres, ideal for containers or small areas. 'Pixzee' peaches and 'Nectazee' nectarines produce large fruit and have a medium chilling requirement of 500 hours. Low-chill varieties are ideal for those who live in the warmer subtropical areas. Some peaches and nectarines, such as 'Tropic Beauty' peach and 'Sundowner' nectarine, have a chilling requirement of only 150 to 350 hours. Consult your garden centre for others.

Varieties of plums and cherries are other great fruit trees you can grow. Not only do they provide delicious fruit, but they're also attractive trees in their own right.

If you live in a cool temperate climate with little rain during the late-November fruiting season, then cherries are for you. Some cherries are self-fertile, whereas others need cross-pollination. Your local garden centre or nursery will sell the best cherries for your region, if they're able to be grown successfully in your area. Some great cherries to look out for are 'Stella', 'Starkrimson' and 'Morello'.

Plum trees are easy to grow and are generally prolific fruiters. You

don't even have to be an expert at pruning them. Just keep them to a nice shape and height to suit you. Plums are usually put into two types, Japanese and European. Both types grow in temperate climates but the European type like it to be a bit cooler. Just about all plums need cross-pollination.

All trees grown for their fruit or nuts only produce if conditions are right. Pollination depends on the temperature and other climatic conditions being right, and birds, bees and other pollinating creatures being in the vicinity. Changing climate can have a dramatic effect on the timing of flowers and the life cycle of pollinating insects.

Mmm, mangoes

Mangoes are a delicious, juicy summery fruit. However, they're well known as giant trees that grow prolifically in the tropics and subtropics, attracting fruit bats by the hundreds, driving everyone mad with their screeching. These huge trees also produce an abundance of fruit, more than you and your neighbours could ever hope to eat. Fruit rotting on the ground is a breeding ground for pests, such as rats, and possums in New Zealand. Not very nice in your tropical or subtropical oasis. Plus they can really pong! But there is another way.

A number of smaller varieties of mango tree have been developed, some you can even grow in pots, and you can keep them that way simply by cutting them back. Mango trees don't have to be huge, because, really, how many mangoes can you eat? Well, lots, I know. But, realistically, if you can have a few different varieties of the smaller trees, with staggered fruiting times, in pots or in the ground, you could be harvesting mangoes for quite a few months.

Mangoes can be grown as far south as Melbourne, not just in the tropics. You do need to be attentive to their needs, though, and ensure that they're in a very protected and sunny part of the garden that won't be exposed to any frost.

Mangoes do require cool nights to bring about flowering, but that

means about 15 degrees Celsius. In New Zealand, Tasmania and Victoria that's around the winter maximum! Poor flowering means reduced fruiting, alas. A variety that is suitable for cooler climates is 'Nam Doc Mai'. This variety produces plenty of sweet, juicy fruit regularly in cooler areas.

Another variety, the mango 'R2E2' (no, not R2D2 of *Star Wars* fame), is also a suitable variety for cooler areas and also for container planting. The fruit is sweet, not too fibrous, and the seed is smaller, so you get more juicy mango for your money. A mango tree that can go into a pot is a great idea because the container can be moved around the garden to make the best use of optimum growing conditions — warmth, protection from wind and protection from the cold on cooler nights.

If you live in subtropical or tropical areas of Australia, you can plant a number of mango varieties that are suitable for a small area:

- **'Dwarf Irwin':** The fruit is fibreless and deliciously sweet. A good producer of large reddish fruit growing to a height of about 2–3 metres.
- **'Glenn':** This one was discovered as a seedling tree in the 1940s in Florida, USA. Its fruit is deliciously juicy and the tree can be kept to a height of about 3 metres without diminishing fruit production.
- **'R2E2':** This grafted mango produces large and attractive fruit with a sweet flavour and high ratio of flesh to seed. It has a vigorous and upright growth habit to about 6 metres.

Goin' troppo for bananas

The other tropical fruit that everyone, well, surely everyone, must love is the banana. However, bananas really do like a warm and well-protected, wind-free environment to grow in. They crave a rich fertile soil and the more nitrogen-rich organic matter you can give them the better.

They like to be grouped together, too, so don't just plant one banana plant; company gives them support, literally. They are quite tall and narrow plants and so will topple over if it's too windy or their fruit load is unsupported. That's why they like to be planted together.

Bananas don't like extremes of weather or extremes in moisture either. They like to have adequate moisture every day. A weekly deep watering, particularly in dry weather, keeps them happy. Banana

leaves are very large, which means the plant loses lots of moisture through its leaves because of the heat it so enjoys. Planting in groups also increases the humidity, and they love that too!

Bananas grow best in tropical or subtropical areas along the Australian coast, from Carnarvon in the west, all the way around the top of Australia to Coffs Harbour in the east. Although, given the right conditions, you might get them growing in Hobart! If you live in cooler climates, check out your local nursery for banana cultivars that you can have a go at planting.

Although banana trees are very thirsty plants, they produce an enormous amount of fruit. However, because they need to be planted in groups, they may be too large for smaller areas.

Two cultivars for the home garden are 'Lady Finger' and 'Pisang Ceylon'. If you live in a frost-free, warm coastal climate, you could grow bananas as far south as Perth and Sydney. I've even heard of people having a go as far south as Hobart.

'Ava avocado

Avocadoes are just so lovely. Halve the fruit and scoop the flesh out with a spoon, maybe with a bit of salt, or mash them with some salt and pepper on fresh bread. For the Aussies reading this, my best friend's mum would mash the avocado on bread spread with Vegemite — absolutely beautiful!

There's something exotic about the old avocado and it is so good for you. It's a rich source of vitamin E and folate. Folate in the diet has been shown to reduce the risk of stroke, high cholesterol and heart disease. Avocadoes are beneficial to your eyes because the lutein they contain helps prevent macular degeneration and cataracts.

The avocado tree is a very large tree with a spreading habit. It likes a sunny position and, when young, needs protection from frost and wind. Avocadoes thrive in a well-drained, friable (crumbly) soil. They have a very deep and extensive root system so, if your soil is sandy, your tree should be quite happy, provided you incorporate lots of organic matter into the soil and mulch the tree well. Make sure that your soil does drain freely because they really do detest wet feet and will suffer root rot very quickly. Some avocado enthusiasts have been known to dig a large hole for the tree, fill it in with the soil they just dug out, then plant the tree on top, surrounding the roots with free-draining soil and plenty of organic matter, and topping it off with mulch. Some sort of timber or other border is needed to keep the

whole thing contained.

Avocado trees in the tropics and subtropics do a very strange thing, because avocado flowers have both male and female reproductive organs. When flowering time arrives in the subtropics or tropics, each avocado flower opens twice over a two-day period, the first day as female and the second day as male, when it releases pollen — how curious. Avocado trees are grouped as Type A (such as 'Gwen', 'Hass', 'Pinkerton', 'Reed' and 'Wurtz' varieties) or Type B ('Fuerte', 'Sharwil' and 'Shepard' varieties). In order to have pollinated flowers, the two varieties are required. The Type A tree's flowers are female until the afternoon of the first day, when they close and then open as male in the afternoon of the following day, when it's warm enough. The Type B tree's flowers open as female in the afternoon of day one and open as male the following morning. An overlap in flowering occurs in the middle of the day for between one and three hours. Air temperature regulates the opening and closing of the flower and it is during this overlap time that pollination occurs. (And you thought human reproduction was complicated!)

Getting away from the complicated stuff, basically the successful growing of avocadoes has three requirements:

- An overlapping of the flowering stages between the two types of tree.
- Insect activity to assist with pollination, particularly bees.
- Temperatures above 10 degrees Celsius while flowering and for three days following.

If you're really keen on growing avocadoes, get advice from your local nursery or garden centre for the best varieties for your place. In cooler areas, say south of northern New South Wales or in New Zealand, avocado flowers stay as males, so the flowers don't pollinate. However, many cultivars show sufficient overlap (a bisexual phase) to allow self-fertilisation, so only one tree is necessary. The low temperatures cause the opening times of the flowers, both male and female on the one tree, to overlap, so pollination can occur.

If you live in the southern states of Australia or in New Zealand, where the temperature frequently drops below zero, you may find that the cultivar 'Bacon' is the one for you. It's very tolerant of cold conditions, fruits early and has a delicious flavour.

Avocado trees usually start to bear fruit after about three years. The fruit matures on the tree, but will not actually ripen there. When the little stem starts to turn yellow, pick the avocado and place it in a bowl or box to ripen. This may take a number of days. Remember to be careful — when avocadoes begin to ripen, they bruise very easily. If you want to hasten the ripening of the fruit it can be placed in a brown paper bag on its own or with a banana or apple. Ethylene gas, which all three of these fruits produce, hastens the ripening. If you put them in a bag, the ethylene gas is trapped, thus speeding up the process.

If space for these sprawling trees is a problem, you'll be happy to know that a couple of dwarf varieties, 'Rincon' and 'Wurtz', are available. These two varieties of dwarf avocado, and the 'Pinkerton', are great choices for warm temperate zones or the tropics and are very happy in a large container. They produce fruit a little bit earlier than their larger cousins in the ground too, and look lovely with their glossy green foliage.

Going nuts for nuts

Nuts are a little trickier than fruit trees because some nut trees are enormous — think walnut, chestnut, pecan and macadamia. If you have only a small area, almonds or hazelnuts could be an option, depending on whether or not you have the right conditions for them.

Hazelnuts are deciduous and are best suited to the cooler southern parts of Australia and New Zealand. They have a high water requirement, over 900 millimetres per year. New Zealand has plenty of water for growing hazelnuts; not so in Australia anymore! Hazelnuts have a chilling requirement of 500 to 900 hours below 7 degrees Celsius. They can tolerate some frost, but temperatures below -5 degrees Celsius will affect the flowers. Hazelnuts start producing nuts by their third year and at maturity can produce between 5 and 12 kilograms of nuts per year.

Hazelnuts also require pollinators, so two or more varieties need to be planted fairly close to each other in order for the plant to produce fruit. Hazelnuts are not huge trees; in fact, their natural habit is that of a bush or small multi-stemmed tree, so they can be trained and pruned into a hedge or large shrub rather than a single-trunked tree.

To grow hazelnuts you need a well-drained soil that's not too heavy, to allow for adequate root penetration, with a pH in the slightly acidic range (refer to Chapter 2 for information on soil pH levels). They dislike hot northerly winds and don't thrive in soil that is allowed to

dry out because it causes them root damage.

Almonds are another popular nut tree for cooler climates and they have much the same requirements as hazelnuts — rich, fertile, free-draining soil, cooler winters and adequate water, about the same amount as the hazelnut needs. Almonds also require a pollinator. There is one cultivar, 'All in One', that is self-pollinating and has a softer shell, probably perfect for the backyard.

An almond tree will grow to about 5 metres high by 3 metres wide and is the earliest of all the deciduous nut trees to blossom. Almonds are really easy to harvest — just give the tree a bit of a shake when you see that the husk has split, which means the fruit is ready for harvesting. The nuts fall to the ground. Spread them out in the sun or a warm place for the shells to harden, ready for storage.

Always buy grafted trees from a reputable supplier as some almond seedlings grown from seed produce poisonous nuts.

Growing What You Need

Your ability to grow what you need depends upon where you live in Australia and New Zealand. Australia, and to some extent New Zealand, has many climate zones, and climate zones dictate what you're able to grow and when you're able to grow it.

It's a balancing act really. Most vegies need warm conditions to grow, so planting such vegies in the depths of winter will leave you bitterly disappointed. At the opposite end of the spectrum, if the conditions are too hot and humid, they won't grow. So what do you do? You refer to the planting guide for your particular climatic zone. You can find one of these in most popular gardening magazines, or have a look at *Gardening For Dummies*, Australian & New Zealand Edition, by Shirley Stackhouse and Jennifer Stackhouse (Wiley Publishing Australia). You may live in a cool, temperate, subtropical or tropical area. This classification dictates what and when you plant.

You may love tomatoes, but if you live in Melbourne or Auckland you won't be able to grow and eat them all year round because they love the warmth. All Melburnians know that tomatoes get planted on Melbourne Cup Day, the first Tuesday in November!

So you now need to make a moral decision: Should you only eat what is seasonally available to you? That's a tricky one. I mean, I can wait until spring for asparagus, but to go for six months without a tomato — I don't think so.

Think about what you feel like eating over the summer months. Salad vegies — lettuce, cucumber, tomatoes, beetroot. What do you feel like eating in winter? Potatoes, pumpkins, cabbage and cauliflower, of course.

According to an Australian Bureau of Statistics survey in 2002, Australians eat 92 kilograms of fruit, 96 kilograms of vegetables and 54 kilograms of starchy foods such as potatoes. That's a grand total of 242 kilograms per person per year.

Using this statistic as a guide, now work out how much of each crop you need. Many vegies will keep for longer periods than others, especially pumpkins, potatoes and sweet potatoes. Carrots, turnips and beetroot also keep well, but not for as long. So, if you have the storage space, you can have a whole year's supply of pumpkins kept in your shed and a few months of spuds.

You may be able to store root vegetables, but you don't really want 20 cabbages or broccoli heads ready for harvest at the same time. To avoid this dilemma, plant a few seedlings of each at a time, at fortnightly intervals. This practice ensures a regular harvest of fresh vegies for you and your family instead of a glut of vegies all at once.

Decide if you want to grow your vegies from seed or buy seedlings. Growing from seed is by far the cheapest way of growing vegies, and it allows you to experiment a bit with different varieties of vegetables. Nurseries don't stock half a dozen different types of cabbage or bean seedlings because it's not economically viable for them.

However, if you look through specialist seed catalogues or the seed display racks at the garden centre, you'll be pleasantly surprised at the exciting varieties available to you for just a couple of dollars. And most seed packets contain many, many, many seeds — more than you can use in one season of planting. If you're really impatient, plant some seedlings, which produce more quickly, and some seeds! You can let some of your vegies go to seed so you can collect the seeds and store them in a jar or brown paper bag ready for the next season.

However, beware that some vegies can end up becoming weeds in your backyard. I've seen some lettuce varieties left to go to seed only to find them coming up everywhere the next year.

The yield you get from vegies like beetroot, cauliflower, cabbage and carrots is easy to work out. Plant one carrot seed or seedling and you get one carrot.

Potatoes, tomatoes, cucumbers and pumpkins are very productive crops and each plant can have a very heavy yield. Listed in Table 12-3 are some examples of different varieties of vegetables and their expected yield.

Table 12-3 Yields of Some Vegetable Varieties

Vegetable	Yield per Plant (approximate)
Cucumber, 'Lebanese'	10
Bean, 'Greenfeast'	2 kg
Potato, 'Sprunta'	1 kg
Pumpkin, 'Australian Butternut'	8
Tomato, 'Grosse Lisse'	6 kg
Zucchini, 'Black Beauty'	2

Planting by the Season

The chance of success with your vegie growing vastly improves if you plant by the season. This is not necessarily as clear-cut as it may first appear.

In New Zealand and the southern two-thirds of Australia, seasons are fairly well defined.

- **Summer:** December, January, February
- **Autumn:** March, April, May
- **Winter:** June, July, August
- **Spring:** September, October, November

If you live above the Tropic of Capricorn, and many Australians do, then you live in an area that experiences tropical monsoonal weather conditions and seasons are defined as the wet and the dry season.

- **Wet season:** November, December, January, February, March, April
- **Dry season:** May, June, July, August, September, October

Some parts of Australia and the far north of New Zealand experience subtropical weather. The summer months are warm and humid, and winters very mild.

Some great resources are available for learning about your climate and what to grow in each season at your place. Many of the popular garden magazines in both Australia and New Zealand have good seasonal planting guides. You can also find this information on various websites and in publications from specialist plant growers.

Figures 12-4 and 12-5 illustrate just how many climate zones there are in Australia and New Zealand respectively. Climate zones have a huge impact on what you can successfully grow at any time of the year in your area.

Figure 12-4: Australia's climate zones.

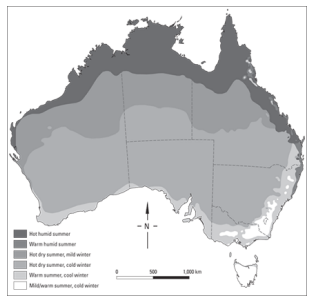
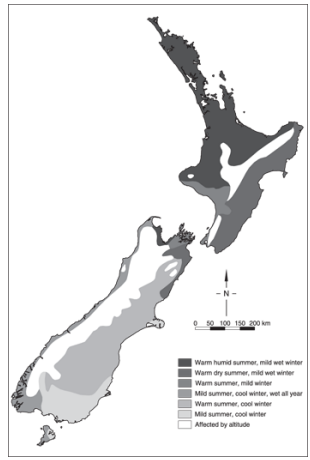


Figure 12-5: Climate zones of New Zealand.


N
0 50 100 150 200 km
Warm humid summer, mild wet winter
Warm dry summer, mild wet winter
Warm summer, mild winter
Mild summer, cool winter, wet all year
Warm summer, cool winter
Mild summer, cool winter
Affected by altitude

Chapter 13

The Impossible Dream? Installing a Sustainable Lawn

In This Chapter

- Learning to love your lawn
- Looking after your lawn sustainably
- Exploring alternative lawn grasses
- Choosing better ways to mow

For years, in Australia and New Zealand, gardeners have worshipped the traditional English-style garden, complete with lush green lawns maintained to a ridiculously high standard. Often, these pristine swathes of green were equal to and about as fussed over as the hallowed turf at Lords. Gardeners took great pleasure in their neat, regularly mowed and fertilised pride and joy — perfect uniform blades of grass and not a weed in sight. Unfortunately, a pristine lawn like this probably uses more water than any other part of the garden, and that's one of the reasons many sustainable gardeners are so against the humble lawn.

I have a confession to make: I love lawn. There, I said it. Now I have come out as a lover of lush swathes of luxurious green, I explain in this chapter how you too can love lawn or, if you already love your lawn, how you can love your sustainable lawn even more.

Lawns really aren't that bad and the world as we know it isn't about to end simply because you have a bit of green for the kids to play on or somewhere to stretch out the banana lounge on a summer's day. In this chapter, you learn how to sustainably manage your lawn. I explain the best way to water, feed and maintain your lawn. In

particular, I go over some clever ways you can keep your lawn looking great with minimal water.

I also explore some alternatives to the more traditional types of lawns and grasses, and even have a look at artificial lawn, discussing the pros and cons of putting some in at your place. Finally, I give you some hints and tips on mowing your lawn in a more energy-efficient and sustainable way.

Are Lawns Really That Bad?

People like to have lawns for many reasons other than tradition. Looking out across a cool expanse of green in the hot months is quite soothing to the mind, body and spirit. Or stretching out on a hot day on a thick, lush green lawn. I have friends and relatives who live in some pretty hot, dry, fire-prone areas and they like to keep a bit of lawn not only as a sort of psychological barrier between them and the dry dusty paddocks, but also as a physical barrier between them, the dry dusty paddocks and any fire that may come their way.

Green is a calming, cooling colour, and most humans find green grass cooling and relaxing. Go on a hot sunny day to your local park or botanic garden with expanses of green grass and see how many people are out relaxing and enjoying themselves. Expanses of grass are also important for sportsgrounds. Where are your kids going to run and play, and get much-needed exercise and fresh air if no grassed area is provided for them?

Finding better, more drought-tolerant grass species and more sustainable ways to manage grassed areas is the key. Better species and maintenance practices are important not only for sustainable home gardens, but to also ensure the sustainable management of lawns for public gardens and sportsfields.

Lawns can be an important part of your sustainable garden. They not only give you a place for outdoor recreation; they can also help stabilise your soil so that it doesn't blow away in the wind or wash away in the rain. And the cooling effect of lawns is not just psychological. Even a small area of lawn around your house can lower the air temperature in summer, cooling the hot winds as they blow towards your windows. Your lawn acts as a kind of natural air-conditioning system.

As a sustainable gardener you're most likely concerned about carbon

storage and planting lots of plants to create a biomass to help store carbon in your soil and stop it heading up into the atmosphere, right? Well, think about your lawn; it's not just one, but hundreds, thousands and even millions of individual plants. Managed properly and sustainably, these little plants help to store carbon in your soil, and help you do your bit to reduce greenhouse gas emissions and make your carbon footprint smaller.

However, you can undo all that good by mowing your lawn far too often with a smoke-belching, noisy petrol-driven mower, and pouring fertilisers and all sorts of chemicals onto it to keep it looking nice!

Growing Traditional Lawns Sustainably

Keeping a large traditional-style lawn looking lush and green requires more water than you're likely to use on any other part of your garden. This massive amount of water is not sustainable, particularly if you live in areas experiencing drought and water restrictions. Those massive green expanses also require regular fertilising, close mowing and manicuring — all pretty labour-intensive really.

However, you can still grow a traditional lawn in a sustainable way by following a few sustainable practices in your lawn maintenance and keeping your area of lawn to a minimum. For example, don't try to grow lawn where it doesn't want to grow, such as in damp, shady areas or on steep slopes, and consider using pavers in high-traffic areas, with perhaps some low groundcover in between.

Later in this chapter I discuss different mowers and their energy use and give you some good tips on how to mow more efficiently. But first I look at the different types of traditional lawn grasses so you can choose the right type of grass for your place. I also look at a few things to consider if you're growing your sustainable lawn from scratch, and watering techniques to keep your lawn sustainable. If you're keen to use native grasses or other types of grass-like plants, see the section 'Alternatives to Traditional Lawn Grasses' later in the chapter.

Types of lawn

Traditionally lawns are either warm-season or cool-season grasses. Warm-season grasses go dormant when the weather starts to cool and, in some southern areas, they go yellow over winter. Some people don't like that, preferring a green lawn all year, but sustainable gardeners know that it'll soon green up again when it gets a bit of rain. In some areas, lawns made up of these types of grasses can be pretty drought-tolerant and tough. Cool-season grasses stay nice and green through the cooler months. Those with deep roots might brown off a bit in summer, but can survive through some pretty hot weather and then green up when the rains come.

Some of the common warm-season grasses are:

- **Buffalo (*Stenotaphrum secundatum*):** A grass that spreads by runners creeping along the surface, making it much easier to edge than grasses with underground stems. Common varieties are 'Sir Walter' and 'Sapphire'.

- **Couch:** The generic name for varieties such as 'Santa Ana' and 'Legend'. This one also spreads by surface runners but can be difficult to control. The common couch or 'Bermuda Grass' (*Cynodon dactylon*) is an invader of wetlands, particularly in Western Australia.

- **Kikuyu (*Pennisetum clandestinum*):** A perennial ground-hugging grass that spreads by underground runners. Although this is a common lawn grass, it's considered a weed in some parts of Queensland, Victoria, New South Wales and Western Australia.

The runners that these grasses are spread by are either *rhizomes*, which are a kind of thickened stem that runs under the ground parallel to the soil surface, sending up aerial shoots at intervals, or *stolons*, stems that run along the surface of the soil. Rhizome grasses don't necessarily stay in the lawn but can pop up right through your garden beds. Grasses that spread by stolons are usually a bit easier to control. I've seen some of these creeping grasses, as some people call them, creeping up a downpipe on an old house.

Cool-season grasses include:

- **Fescue (*Fescue arundinacea*):** Tall fescue is a common blade-type grass, which means it doesn't send out runners to invade your garden beds. However, it can spread by seed, as an escapee from

unkempt lawns, invading swampy eucalypt bushland in particular. It needs to be regularly watered to stay green.

- **Rye:** Not usually grown as a lawn on its own, annual ryegrass (*Lolium multiflorum*) or perennial ryegrass (*L. perenne*) is used to over-sow kikuyu in areas where the kikuyu goes dormant and browns off in the colder months. The rye stays nice and green.

- **Weeping grass (*Microlaena stipoides*):** This great native all-rounder is being used more and more as a lawn species. It is a tufting grass that spreads very slowly under the soil.

Buffalo, couch, fescue and kikuyu can be very invasive and, in some areas, are environmental weeds. All it takes to turn them from mild-mannered lawn grass to rampant weed is letting them escape from your garden. Don't let these guys set seed, don't dump your lawn clippings in the bush, and don't sweep them into the gutter so they head down with the stormwater and into your waterways.

Whose idea was it anyway?

For many people, a home is just not a home without a lush, green neatly mown lawn. Gardeners have obsessed about the perfect lawn for hundreds of years, right back to the Middle Ages. Lawns became more common in medieval times when castle courtyards had areas of *sward*, or lawn, where the lords and ladies could take some air. Lawns of chamomile became popular as a place to play and walk about in Tudor times.

It wasn't until the 1600s that the English lawn of today became popular as a status symbol for the wealthy, maintained by servants with scythes and shears. Famous English landscape designer Capability Brown popularised the English park-like gardens with large sweeping lawns. In Australia and New Zealand, the idea of the lush English lawn was taken up with great enthusiasm and no regard for the difference in climate or availability of water.

Planning your sustainable lawn

If you're growing your sustainable lawn from scratch, here are some questions to think about before you start:

- How much sun or shade does the area get?

- What's the lay of the land? If there is a slope, which direction does

it go and where does the water runoff end up? Even a slight slope can make a difference to the success of your lawn.

- What type of soil do you have? Find out the pH (refer to Chapter 2), how much water it can hold or if the water just runs off, and if it's compacted at all.
- What is your water supply — tank, town supply, greywater, bore, dam, the sky?
- What's the lawn for? Maybe it's a place for kids and pets to run and play, or an outdoor entertaining or living space.
- What look are you after — a bit messy, or tidy and manicured?
- How much maintenance are you expecting to do or, better still, how much maintenance do you want to do? Reducing the size of a lawn area can make it easier for you to create a sustainable lawn.
- How much are you prepared to spend on your new sustainable lawn? Do it once and do it well; remember, cheap and quick may just turn out nasty and expensive in the long run.
- What regulations does your local council or water authority impose about watering in your new lawn. In some areas, exemptions apply for a period of settling in a new lawn; after that, it's on its own.

Hydro-mulch grass seeding

A great way to establish a lawn in tricky or large areas is *hydro-mulch grass seeding*, a really clever process of mixing grass seed, mulch and fertiliser into a slurry and then pumping it through a hose and spraying it onto the prepared area. Watching this being done is fascinating. The whole thing is then well watered to make sure the seeds germinate. The mulch is usually recycled wood fibre and paper, which keep the area moist so that the seed has the best chance to grow and the grass can take hold. This method establishes your sustainable lawn quickly and makes sure you get a nice even result. I've even heard of it being done with native seed — even better, and more sustainable.

Watering your lawn sustainably

There is no reason you can't have a lawn in your sustainable garden. Maybe not in the traditional 'English lawn' sense. But if it's a lawn you want, a lawn you shall have. You just need to think about how you water the lawn and even why you water it. Do you water it because

you think you should or because it really needs a drink?

Follow these simple tips to use less water on your lawn (and refer back to Chapter 3 for more on water):

- Only water in the cool of the morning or in the evening. Watering in the middle of the day, particularly on hot days, loses a fair amount of water through evaporation or it simply blows away in the breeze.

- Water less often, say, when it hasn't rained for at least ten days, but, when you do water, give your lawn a good long soak. Make sure the water gets right down into the soil, which helps develop a good strong root system, making it easier for the grass to suck up any available water. Short little sprays of water every day just encourage shallow roots and make your lawn water-dependent. If it rains, just let your lawn live off whatever it gets from the sky. It'll soon adapt.

- If you have a reticulated watering system or a sprinkler, put a bucket out on the lawn, get a timer or your watch, and then turn on the water. The time it takes to get one centimetre of water in your bucket is how long you need to water your lawn.

- Make sure you have a timer fitted onto your sprinkler or watering system, if you use one. How many times have you seen watering systems on all night?

- Keep the grass to about 4 to 5 centimetres high, which not only means you have to mow less often, but it helps to shade the roots of your grass plants and reduce evaporation of precious water from the surface of the soil.

Tips for watering your lawn are all very well if you actually have enough water to use on the lawn. What if you're in a region that has Level 4 or 5 (or even higher) water restrictions? How on earth are you going to keep your bit of green sward around your place? Perhaps think about greywater, which is a great alternative water supply for your grass. You may not be able to use water outside the house at all, but you still wash your clothes and shower. This waste water is perfect to put onto your lawn. Although you may not want to bother with the lawn at all when you could be using your greywater on other plants.

The jury is still out on the effects of greywater on soils and a range of ornamental and edible plants. You may also come up against a whole bunch of environmental problems and government regulations on how and where you can use this stuff. (For more information about greywater, refer to Chapter 3.) But most lawn grasses seem to be quite happy being regularly watered with greywater. I use it on my backyard lawn every summer and it looks nice and green and seems to be pest- and disease-free as well.

Alternatives to Traditional Lawn Grasses

As much as many people may love the look of a traditional English lawn, in most areas they're simply unsustainable. However, if that's the look and style you're after, you can explore some alternatives. As a sustainable gardener, you learn to think outside the square and look at the potential for other plants to become lawn or to do a similar job to traditional lawn grasses.

Choosing non-grass alternatives

Some really good plants that aren't actually grasses make great lawn alternatives. The original lawns of medieval castles weren't the lawns you'd recognise today; they were more like meadows made up of low-growing herbs and grasses, often predominantly chamomile.

When you're looking for a lawn alternative, here are a few things to think about:

- How much traffic the area is likely to get
- Whether the area is mostly in sun or shade, or a bit of both
- The potential of the plant you've chosen to become a weed and take over the garden
- How fast the plant grows (some alternative lawn species can be slow to get going)

- If the plant is readily available and how many you might need (a large area can be expensive, if your chosen lawn alternative comes in pots)

You can divide current lawn areas into some easy categories where you can use alternative plants:

- **No traffic:** You know those spots in the garden where you've tried and tried to get the lawn going? Nobody walks there at all really, and not even the grass wants to go there. Under trees, in really shady parts of the garden or on steep slopes where, even if the lawn does grow, it's an awful place to mow. These are exactly the types of spots in your sustainable garden where you can replace the lawn with a mixture of plants suited to the conditions, perhaps a low ground-hugging grevillea for the bank, or a shade-loving perennial like Lenten rose (*Helleborus orientalis*) under the trees.

- **Light traffic:** These are the areas in your garden that nobody uses very often and you probably don't need lawn there. In these spots, use plants that don't mind being stepped on from time to time. In my garden, I've replaced the lawn completely in one such area with low-growing creeping boobialla (*Myoporum parvifolium*). The only traffic it gets is when the chaps come by to read the gas and electricity meters. I'm sure they're nice chaps, but I don't think I need to provide a manicured lawn for them to walk across. If the traffic might sometimes be a bit heavier in this area, you could put in some stepping stones or pavers.

- **High traffic:** Here is where you probably want to keep your lawn, and where you can start thinking about lawn alternatives, or even plant native grasses. To find out more about fabulous native lawn alternatives, read the next section 'Using native grasses'.

Here are a few good alternatives to traditional lawn grass:

- **Australian native violet (*Viola hederacea*):** Loves the shade and has small flowers; good for medium-traffic areas; no mowing

- **Chamomile:** Creates a great soft 'lawn-like' area that you can walk on; light to medium traffic; mow a few times a year

- **Creeping boobialla (*Myoporum parvifolium*):** No traffic; great for banks as no mowing required; used in nature strips in some areas of Melbourne

- ***Dichondra brevifolia*:** Shady area; light traffic

- **Dwarf mondo grass (*Ophiopogon japonicas nanus*):** Great for between pavers; medium traffic; no mowing
- **Emerald cushion (*Scleranthus biflorus*):** Dense mat-forming groundcover; very light traffic
- **Fan flower (*Scaevola* species):** Needs a sunny spot to part-shade; light traffic
- **Isotoma (*Isotoma fluviatilis*):** Mat-forming; great for very damp sites; no traffic
- **Kidney weed or Mercury Bay weed (*Dichondra repens*):** Comes in green- and grey-leafed varieties; damp, shady area for green-leafed, but the grey-leafed variety can tolerate hot, dry areas; light traffic; no mowing
- ***Leptinella* species:** Light traffic
- **Mint:** Great for keeping flying insects at bay in the summer; peppermint is good for a damp shady area; light traffic; mow at about 5 centimetres height to keep it low
- **Pennyroyal (*Mentha pulegium*):** Damp sites; little traffic; no mowing
- **Pigface (*Lampranthus* species):** Sunny, sandy banks; no traffic
- ***Pratia angulata*:** Light traffic
- **Running postman (*Kennedia prostrata*):** Good for sunny, hard-to-mow banks
- **Woolly thyme (*Thymus pseudolanuginosus*):** Good between pavers; sunny spot; light traffic

Many more lawn alternatives are available. No matter what you choose, check that the plant is the right one for the conditions at your place and make sure it's not a weed where you live.

If you're not sure what to plant, your local nursery could be a good place to start. If you have a native and indigenous plant nursery in your area, even better. They'll be able to advise you on what native plants work best to create a sustainable alternative lawn at your place.

Think about the look you're after. It might be that you don't use plants at all and the best bet at your place is to replace your lawn

with pebbles or gravel, or a mulched garden bed with plenty of low-growing native shrubs and groundcover plants. It's really up to you and your personal taste, and, of course, the needs of you and your family. Remember, if you're replacing your lawn with a garden bed or gravel area, make sure you set aside somewhere for the kids to play or for you to put your banana lounge on a sunny day.

Using native grasses

Replacing your traditional lawn with native grasses is a brilliant way to keep your lawn and make it sustainable. Using native grasses means you use less fertiliser and less water. Native grasses are suited to the local soil and conditions, and are better adapted to withstand drought, flood, fire and just about anything else nature may throw at them.

Here are a few native grasses that are becoming popular, hardy replacements for traditional lawn species in Australia:

- **Kangaroo grass (*Themeda triandra*):** Used in lawns where there is little or no water available; can be mowed to 3 centimetres; will tolerate traffic
- **Redgrass (*Bothriochloa macra*):** A good hard-wearing lawn grass for infertile soils; needs very little water and can be mowed low like a traditional lawn
- **Wallaby grass (*Austrodanthonia* species):** Great for areas of low use or passive use, and where no water is available; best where mowing height can be kept at 5 centimetres or higher
- **Weeping grass (*Microlaena stipoides*):** Versatile grass with a wide range of applications; tolerant of all kinds of soil and conditions, looks good, needs very little maintenance and makes a great traditional-looking lawn; will grow well in areas of moderate to high rainfall

Often a combination of native lawn species is used to grow a hard-wearing, low-maintenance and drought-tolerant lawn that looks good all year round.

Native grasses have some great advantages over traditional English lawn species, because they:

- Are adapted to some pretty poor, weathered and shallow soils with low fertility.

- Are adapted to drought and are usually the first plant species to reshoot after rain.
- Cope with high summer temperatures. In fact, some native grasses stay beautifully green even in high temperatures and with not much water, giving you that green-lawn look all year round.
- Can cope with less mowing. Native grasses grow a bit slower than their exotic cousins, making them perfect for your sustainable garden.

The advantages of using native grasses for your sustainable lawn are many. After they're established, they need much less maintenance than a traditional lawn. Some only need to be mowed three or four times a year. Now that's sustainable!

The disadvantage is that some native grasses can be really slow to get going. You can end up with weeds where your lawn should be, so you need to be really careful about controlling any weeds that might pop up.

Some native grasses are just as tough and hard-wearing as the traditional varieties and, in some areas, you can even get them as roll-out turf. Seed and plants can be a bit more expensive than traditional lawn grasses, but it's well worth the investment for your sustainable garden. Supply of some of these species can also be limited, so planning well ahead and ordering your seeds or plants before you need them is important. The more people who buy these grasses, the more they'll be in demand so supply should improve and, hopefully, they'll become cheaper. Go on, do some investigation to find out the best native grasses for your area and have a go.

For more information on using native grasses or where to get them in Australia, check out www.nativeseeds.com.au and www.nativegrassgroup.asn.au. In New Zealand visit the Oratia Native Plant Nursery website at www.oratianatives.co.nz and select Grass from the products list on the left or use the search window.

Looking at artificial lawn

Artificial lawn! Some people hate the stuff, some people love it. Me,

well, I think there's a place for it. Particularly on sportsgrounds where the alternative is dirt and stones. I'm not sure how sustainable it is though. All that rubber and plastic can't be doing much for the soil underneath, and, when you decide you don't want it anymore, you can't exactly put it into the compost. I have visions of acres of the stuff in years to come choking up landfill.

However, do a bit of research and you'll find that most of the manufacturers of artificial lawn, or *synthetic turf*, as it's typically called, use recycled tyre rubber.

One of the problems with synthetic grass when it first started to be used in Australia was its tendency to fade after a while, leaving a quite odd-looking lawn area. Most manufacturers have now sorted out this problem and what you get is actually an authentic-looking uniform green lawn. You've probably seen it on bowling greens, tennis courts, hockey fields and other places of sporting endeavour.

Some advantages in using synthetic grass are:

- No mowing
- No watering
- Green all year round
- Doesn't get wet and soggy after rain
- Once it's there, it's there — no need to worry about re-sowing bare patches
- Shouldn't need any maintenance for up to ten years

Of course, using synthetic grass has its downsides:

- It has high supply and installation costs.
- You might have to wash, vacuum and rake it occasionally.
- The soil underneath may end up lifeless and sterile.
- Real grass can store carbon, synthetic grass can't.
- The manufacturing process uses lots of energy and produces carbon dioxide, which adds to greenhouse gas emissions.
- It heats up faster than real grass and can hold the heat.
- The grass and underlays used might be tricky to recycle and end

up in landfill.

Better Ways to Mow

A mind-boggling array of mowers are on the market these days. You need to do a bit of research to work out the best lawnmower for your lawn and for you. You can get great big ride-on mowers, mowers that run on two-stroke fuel or four-stroke fuel, electric or battery-powered mowers, and even mowers with little solar panels.

No matter what mower you buy, it needs to suit you and your lawn. A light mower with sharp blades will reduce compaction of the soil and give a nice clean cut, resulting in healthier plants.

The best, most sustainable and environmentally friendly mower is a push or reel mower (see Figure 13-1). Not only do you get a good workout pushing it up and down your lawn, it uses no fuel so produces no pollution, it makes very little noise so you won't drive the neighbours mad when you mow on a Sunday morning, and it leaves the grass clippings on the lawn as mulch. Or, if you don't want it there, you can get even more exercise by raking up the clippings. In fact, some push mowers even come with little detachable grass catchers.

A push mower doesn't suit everyone. You might not be physically able to push one around or your lawn area may simply be too big. Look for a mower that suits the size of lawn you have and is economical to buy and run. This could be a two-stroke or four-stroke petrol mower (see Figures 13-2 and 13-3), electric or battery mower.

Figure 13-1: Push mowers give you a great workout while you mow.

Figure 13-2: A two-stroke petrol mower may suit your circumstances.

Figure 13-3: A four-stroke ride-on mower may be best if you have a large lawn.

Electric mowers (Figure 13-4) seem like a good alternative, but, of course, you need to think about where and how your electricity is produced. The downside of these mowers is the need to trail the power cord behind you.

Battery mowers are another alternative. The Enviromower (Figure 13-5) produces no exhaust emissions and starts with a push button, so no cord to pull! This mower has a 24-volt battery and an electric motor, making it basically a cordless electric mower, so you don't have to worry about running over the cord. You can even get a trimmer and edger attachment so you can use it for just about all your lawn maintenance. If you buy your energy from a 'green' energy supplier or you generate your own renewable energy, this mower can end up being carbon neutral. You can't do that with a petrol mower. Do a bit of research and make sure you get a battery mower that has enough charge to do all of your lawn in one hit. Nothing worse than getting halfway through and the battery goes flat. Some of these batteries can take 24 hours to recharge.

Figure 13-4: An electric mower may be a good alternative to petrol mowers.

Figure 13-5: Battery-powered mowers, such as the Enviromower, can be pretty-much carbon neutral.

Solar-powered lawnmowers (Figure 13-6) are an amazing invention. When they're fully charged up, most can mow for around 80 minutes. I reckon, if it takes more than that to mow your lawn, your lawn's too big. They generally produce 75 per cent less noise than conventional mowers. The Solazone mower has a solar recharging unit that you attach to your fence or on a stake in the ground in a sunny spot in your yard. How environmentally friendly and sustainable is that!

Husqvarna has brought out the world's first solar-powered robotic mower (Figure 13-7). A must for every lazy, lawn-loving sustainable gardener perhaps? Apparently it can mow for about an hour on sunny days before it needs recharging. Wire cables on the bumper bar help it define its boundary. It uses the same amount of energy as a 40-watt light bulb and is made of 90 per cent recyclable materials. Amazing.

Figure 13-6: The Solazone solar-powered mower has a recharging unit you can attach to your fence.

Figure 13-7: The Husqvarna solar-powered robotic mower is a world first.

Here are a few tips on sustainable ways to maintain your lawn:

- Raise the deck of your mower and mow to a height of between 4 and 5 centimetres. This helps to shade the roots and the soil, and minimise evaporation of precious water.
- Mowing higher also means the grass grows stronger and thicker, and won't leave gaps for weeds to grow. Longer grass gives more leaf area to make food for the plant and builds a stronger root system. Cutting lawns short makes for an unhealthy lawn.
- Make sure the blades on your mower are sharp so they cut the grass neatly and cleanly. If they're blunt they tear or chop the

grass. Sharp, clean cuts mean the little grass plants use less water. Tearing the grass creates a bigger surface area to lose water from so, in the long run, you end up with weaker, thirstier plants. Weak plants are more susceptible to pest or disease attack.

Birth of the mighty Victa

The first lawnmower was invented by Edwin Beard Budding in 1827, and I bet the servants with their shears and scythes were happy about that! However, the first rotary mower was invented by an Aussie, Mervyn Victor Richardson, in the 1950s, in his suburban Sydney garage. Powered by a two-stroke petrol engine, it was a revolutionary design, more powerful and much lighter than other mowers of the day. Mervyn made the mower for his son Gary, who had started a lawnmowing business to earn some money while at university. He had seen a demonstration of a mower invented by Lawrence Hall in 1948, which Hall called the 'Mowhall'. It was a heavy, cumbersome thing that needed two men to pull across the lawn with a rope. Richardson adapted the idea, and four years later the Victa was born. Production of Victa mowers hit the five million mark in 1992, and they're still going strong.

Chapter 14

Containers and Other Gardens for Small Spaces

In This Chapter

- Deciding on the best containers and plants to suit
- Looking after your containers and plants
- Potting (and repotting) your plants
- Choosing the right potting mix
- Feeding and watering your plants
- Creating the space to garden
- Moving outside your square with community gardens

If you're an urban-dweller with limited space, you can still have a garden, and a sustainable one at that. And you also have a number of options. Potplants, or container gardens, are probably the most obvious choice, but other solutions also exist.

Container gardening is great fun because it gives you a huge amount of planting, growing and creative freedom. And planting in pots and other containers is not only the domain of people who live in apartments who don't have any bare earth to plant into. Consider how much better a verandah looks with some hanging baskets or potted plants. You can even resurrect the old wheelbarrow by filling it with some annuals and positioning it strategically in your yard, or plant succulents in old tin cans or herbs in beloved old boots. Terracotta pots planted with low-growing shrubs along a front path can also look terrific.

Container planting is actually very sustainable because so many

receptacles can be reused — all they need is adequate drainage in the bottom. So, in this chapter, you learn about the huge variety of containers available to you. And I give you a few tips to guarantee success in your container garden. Important issues like understanding the characteristics of different types of container, knowing when to repot a plant and the best type of potting mix to suit your needs, as well as how to keep your plants healthy in an environment that is not natural to them.

Also, I fill you in on some very impressive ways to cope with limited space or achieve garden status with the neighbours, using a couple of very creative and innovative techniques that a decade ago were virtually unheard of — vertical gardens and roof gardens. In this new world of sustainability awareness, these techniques are gaining some very serious street cred. You could be a trendsetter with these little beauties. Another idea if you have only a small yard — or none — and you're keen to grow some vegies, is to join a community garden, or even start your own.

Buying Pots and Plants for Potting

Planning your perfect container garden needs a little decision making, not the least of which is selecting the type of containers you want from the massive variety available. And your dilemma doesn't stop there. You need to also consider what you want to plant there, how long you want the plant to stay in the container and how much you want to spend.

One of the best ideas I have seen yet are little potplant stands on wheels. They're a great investment if you want to preserve the health of your back and keep working in your sustainable garden.

Choosing your containers

Are you going potty for pots? Yep, there are so many to choose from that choosing the right one can become confusing. Here I look at a few types of containers to consider.

Plastic containers

The beauty of plastic containers is the huge variety of shapes and sizes, some cheap, others more expensive. They are also lightweight, which is a great advantage because, when large pots are filled with soil, they can be darn heavy and very tricky to move around.

Most plastic containers are pretty durable, although a few types can become brittle over time when they're outside facing the elements day in and day out.

The other thing with plastic you need to check is that it's safe for your plants, particularly if you're planting vegies in your pots, because you don't want the pots to leach chemical nasties. Another advantage of plastic pots is that the soil doesn't dry out as quickly as it does in unglazed terracotta pots.

Self-watering pots (well, almost)

Some plastic containers have a special design feature called a *water well* (and a few ceramic ones have this feature as well). This is a pretty clever invention because it allows the water to sit in a well at the base of the pot and be drawn up into the soil by capillary action — fabulous for forgetful gardeners who overlook watering indoor or patio plants.

Some species of plants particularly like this type of bottom watering, including the African violet. Another advantage is that the well is usually topped up from a little opening at the top of the pot, and the well negates the need for frequent watering. Great if you're away from home a lot.

Timber

In Australia, wine barrels cut in half are very, very popular as planting containers. They're reasonably priced for their size and look a bit rustic. Numerous styles of timber planting boxes are available, from the rustic to the folksy (window boxes) and whimsical (wishing wells). A tour of a few garden centres will set you right. You'll often find handcrafted timber containers at craft or country markets on weekends. Perfect for a Sunday outing and probably a bonanza for picking up cheap plants propagated by sustainable gardeners like you! Timber also has the advantage of remaining relatively cool over the warmer months, which is beneficial to the health of your plants.

Make sure the timber used has not been chemically treated. Treated timber products continue to leach nasty chemicals into the soil in your container and have a negative effect on your plant.

Terracotta and concrete

Terracotta pots are rustic, earthy and beautiful but, unfortunately, they do break and chip easily. Don't move them around too much to avoid too much damage — you'll save your back as well, because they're usually very heavy. Terracotta pots can be bought glazed or unglazed in a huge variety of colours and styles. A glazed pot retains the moisture in the potting mix; in an unglazed pot the moisture seeps out through the pot, which means more frequent watering for that particular plant, unless you find one with a water well that retains water at the base of the pot. You can paint or spray a sealant inside your pot to help keep the moisture in; just check that it's safe for your plants first. Alternatively, consider placing a plastic pot inside a terracotta pot, which can also make repotting easier.

Quite often, pots stain or grow algae and even moss on them if they're damp and in a shady location. I don't actually mind this — it's a nice rustic touch and, depending on the plant that is in the pot, can add to the overall effect. Some people say that, if you want to achieve this mossy effect on pots or even rocks in the garden, just pour milk onto the area you want to be mossy. I've not tried this myself — one of those things I've meant to do, but never got round to it. You know how it goes!

If you want longevity and stability in a pot, an alternative to terracotta is concrete. Of course, as concrete is much heavier than terracotta, you definitely don't want to move it about. It's probably even too heavy for the pot trolleys you can buy. However, concrete is perfect for taller and large plants such as miniature fruit trees like apple or citrus, or feature trees, particularly deciduous types like Japanese maples with their gorgeous red autumn foliage.

Considering what to plant in your

containers

Many, many, many plants can be containerised, including annuals, flowers, vegetables, herbs, strawberries, fruit trees, natives, succulents — the list is endless. However, some plants simply don't thrive in containers because of their habit or size. Many large eucalypts, for example, don't suit containers because of their extensive root systems. Purchasing an expensive species doesn't guarantee that it will grow and thrive either. Finding that your gorgeous container specimen has survived only six months is a very discouraging and possibly expensive exercise.

A plant that is hardy and doesn't require much attention in the garden (watering, fertilising, pruning) behaves much the same in a pot. Well, almost. Potted plants usually need a little more water in the warmer months than the same species in the garden or, no matter how sun-loving they are, a spot that is a little more shaded during the scorching summer weather. Not because the plant itself can't cope, but because the container becomes hot. In turn, the soil heats up and, before you know it, you have a plant with a baked root system. Remember, plants in pots don't have the ground to insulate their roots. Bear in mind also that, as the plant grows, it depletes the nutrients and will, at some stage, need repotting, maybe dividing or at least topping up with fresh potting mix.

Pots are perfect for plants that you know have serious potential to spread into areas of the garden where you don't want them, such as mint or some types of bamboo, or those that have invasive root systems, such as umbrella trees. Specimen plants such as figs, which grow to a massive size in the garden, can be contained quite nicely in a pot.

When you're purchasing a plant for a pot, check the label. Most labels tell you whether or not the plant is suitable to keep in a container. If you're still unsure, ask a reliable and knowledgeable nursery person.

What you can do with container gardens is limited only by your imagination. Refer to magazines and garden centres for more

inspiration. In fact, garden centres often have great displays of container plantings, combining a variety of compatible species to obtain maximum effect. But you don't have to buy theirs — buy the plants and then go home and replicate their ideas! With a little bit of experimentation you'll soon become an expert when it comes to potting up amazing combinations of plants with their varied colours and textures.

Thinking about how long to keep a plant potted

Spring hits and you want instant colour surrounding you, on your verandah, in that bare patch under the apple tree, on your steps leading to the front door, on your dining table, in your lounge room. Container planting fills the void. You can add instant colour wherever you want with a few pots of polyanthus, for example.

Planting for the short term in containers is completely acceptable in your sustainable garden. Often, plants that initially find a home in a container can be rehoused in the garden years later, when they get too big for the pot. Obviously vegetables and annuals are very short term, whereas succulents can stay put for years, as can many other plant species.

Sometimes plants grown in containers die — don't beat yourself up about it. But, if you keep forgetting to water the maidenhair fern in the bathroom as often as you should, perhaps try a different type of fern, an African violet, or even something plastic that looks real!

A friend of mine wants to grow some of the dwarf varieties of fruit trees. The problem for her is that she rents at the moment. Container planting is the perfect solution, ideally in half wine barrels. The little fruit trees will happily grow and produce fruit to their hearts' content. When it comes time to move house, the fruit trees are easily moved also. If my friend ever decides to buy her own home, she then has the choice of keeping the little trees in their pots or

transplanting them during winter into the ground and using the wine barrels for something else in the garden. Maybe not even for a plant — she may decide to line the barrel with the appropriate type of plastic and make a fish pond!

Pondering plant placement

Location is important for the health of your plants. If you have a very shaded courtyard, for example, you're probably not going to have much luck with flowering annuals. Look for plants with bright or interesting foliage to add a splash of colour to your courtyard garden. If you fancy a particular species but it won't tolerate wind, buying it has little point unless you have a sheltered position for it. You also want to ensure that the sheltered position is visible to you so you can actually admire your specimen. If the only sheltered position you have is down the side of your house where you keep the bins, don't bother buying a plant that doesn't tolerate wind! Plenty to think about really.

The health of the plant isn't the only reason to consider where to place your containers. Very attractive pots with gorgeous plants in them that are highly visible are also highly attractive to the passerby. You like to think that thieves and robbers don't come anywhere near your neighbourhood but this is often not the case. Think carefully about what you put on your front verandah that could be removed with relative ease. Cases have been reported in various parts of Victoria where thieves have actually taken newly planted trees, shrubs, roses, anything really, from other people's gardens — hard to believe someone would do that, but they do.

Caring for Containers and Plants

Potted plants usually receive a little more attention than plants out in your garden. They're often in prominent spots — a little bit of a showcase — and are close at hand. Most container gardeners like to potter about their plants, picking off the odd dead leaf or errant

caterpillar, admiring new growth or budding flowers, so you're likely to spot any problems with a potted plant fairly smartly. The plants certainly don't mind being fussed over and it's very satisfying for you. The pots themselves, however, pretty much look after themselves.

Maintaining containers

Plant containers are usually fairly maintenance-free. Terracotta or concrete may develop a mossy growth over time, or may show a salt residue. Sometimes these effects can look quite rustic and attractive. If, however, you don't happen to like the mossy or salty look, you can quickly remedy the problem. For mossy pots, you need to wash, maybe even scrub, your pot with a mild solution of household bleach mixed with water, say one part bleach to ten parts water (which won't harm your plants if you accidentally splash them), and then rinse off the mossy residue. For the salty pots, spray with vinegar and then scrub with a wire brush or an old nailbrush or laundry brush. Then rinse off the vinegar with water. This is an irregular maintenance requirement and is fairly quick and easy to do.

You may find that plastic pots become brittle over time. The rims or sides may crack or break off, which looks rather unsightly. The best option here is replacement. The plant can be put back into a new pot of the same type and size, or you might see a cracked and brittle pot as an opportunity to justify buying something new and different — I would! If appropriate, you could also take the opportunity to move up a size and buy a bigger pot.

Maintaining potted plants

Maintenance of the actual plant in the pot requires a little bit more time and observation than the pot needs. Whatever you do, remember to keep the tag that came with the plant, or jot down some notes if you bought it tagless from a market. Don't throw out that tag — slip it inconspicuously into the soil at the side of the pot or put it somewhere safe so you can refer to it three months, six months or years later. It can tell you about the plant's needs, such as how much shade or sun it likes, and the type of fertiliser to feed it.

Given the right growing conditions, most potted plants thrive. But, in order to grow, they need nutrients. Plants in pots have a finite availability of nutrients — when they've depleted the nutrients in the potting mix, that's it. Your little plant then fails to grow any more and,

in the worst-case scenario, it dies. You need to replenish the nutrients by fertilising. For more on caring for your potted plants, see the section 'Taking Care of the Essentials: Food and Water' later in this chapter.

Potting Up Your Plants

When you've brought your prized plants home from the nursery, you'll probably want to get them into attractive pots as soon as possible so you can admire your beauties in full splendour. Before you remove them from their nursery plastic, you need to prepare your new containers. Here are a few simple steps to pot up your plants.

1. Select a container around 2 to 5 centimetres bigger in diameter than the pot the plant is in and make sure it has adequate drainage holes in the bottom.

Several small holes are best, but one large hole will do (see the section 'Watering your plants' later in this chapter). You can put small stones, or broken bits of pots or tiles in the bottom to help with drainage and to stop the potting mix from falling out the holes.

2. Put some good-quality potting mix into your container to a depth that will allow the top of the original soil to sit about 1 centimetre below the rim of the new pot.

The next section gives you loads of information on potting mixes and even some recipes to mix your own.

3. Gently tip the pot upside down, holding on to the plant with your palm across the top of the soil and your fingers splayed around the plant stem, and let it slide out into your hand.

If it's a little stubborn, squeeze the sides or tap the pot gently on a solid surface. If it's still problematic you may have to carefully cut the pot away.

4. Place the plant into the new pot and top up with potting mix.

You might want to tap your pot gently on a firm surface to settle the mix down. Don't press it in.

5. Water your container thoroughly and keep an eye on it while your plant is settling in.

After a while, plants outgrow their containers. A plant may look

crowded, like it's obviously too big for the pot, or it may start to lose leaves or look yellow and off-colour — telltale signs that you need a bigger pot. Just follow the potting steps outlined here, although, if your plant is in a ceramic or terracotta pot and it doesn't want to slide out easily, you may have to smash the pot with a hammer — more bits for the base of your pots.

If the plant is *rootbound*, also called *potbound*, with the roots in a tangled solid mass circling the pot rather than growing straight down, you know the plant's been in the pot way too long. The plant will be stressed, but may survive through repotting, though you may need to tease the roots out or prune them back a little. Be aware that some plants don't like to have their roots disturbed too much. Many Australian and New Zealand natives fall into that category.

When you transfer the plant, rootbound or not, use as much new potting mix as you can — don't bother with the tired old original soil, except for what's still around the roots. For stressed plants, you can also add some slow-release fertiliser or, for quicker results, some liquid feed (see the section 'Feeding your plants' later in this chapter). Mulch is also a good idea, but preferably using organic material (refer to Chapter 9 for more on mulch). Inorganic mulch such as pebbles can cause the growing media to heat up in a pot in summer, particularly terracotta, and you could fry the roots.

Selecting Your Potting Mix

Plants in pots need more than just plain old dirt to survive. Unlike the garden, no worms and fewer microorganisms and organic matter live in potted soil to produce the nutrients your plants need. The potting mix a plant comes in when you buy it should contain the right nutrients, but they are a finite supply and you need to replenish the mix from time to time.

When you pot a plant from scratch, you need to ensure it has the right soil to thrive. You can buy prepared potting mixes — some are made especially for particular plants — and, in this section, I tell you how to choose the right potting mix for your plants, as well as how to make up your own. I also discuss reusing potting mixes.

Using prepared potting mixes

Potting mixes are soil recipes devised by plant specialists, and are sometimes referred to as *growing media*. Some growing media is labelled organic, in which case it contains no artificial ingredients. Some types of media have fertilisers already added to the media, some of which are artificial, such as pelletised synthetic slow-release fertilisers. The potting mix your plant is in when you purchase it is the ideal mix for that plant to look fabulously gorgeous in the nursery so you'll buy it.

However, when you need to top up the potting mix or replace it, you need to know what you're buying. I'm sure you've noticed the many, many brands and types of potting mixes available, some of which are prepared specifically for certain species. The reason for this is that different species of plants require nutrients in different ratios.

All mixes must meet guidelines set by the Australian Standards Certification for Potting Mix AS 3743-2002, which has two levels of certification. A bag with a black standards tick is a 'regular' potting mix and doesn't include any artificial fertiliser. If the bag has a red standards tick, it has been fortified with a certain amount of fertiliser and is probably labelled 'premium' and guaranteed to provide nutrients to your plants for a certain period of time.

These standards test a number of aspects of the potting mix, such as:

- The water-holding capacity of the mix
- How well the potting mix drains
- The amount of nutrients it contains
- The pH of the mix (refer to Chapter 2)
- How well it anchors the plant in the container

The Australian standards also include storage requirements prior to sale. The mixes should be stored in the shade, with a temperature between 15 and 25 degrees Celsius.

Safety is important with potting mixes. Bagged potting mix must carry a health warning. Potting mixes may irritate or inflame the

eyes, throat and lungs, and have been linked to Legionnaires' disease. If you suffer from a respiratory condition, asthma or allergies, or have a low immune system, please, please take heed of this warning and use the safety precautions. When handling potting mix, ensure that:

- The area is well ventilated.
- You are wearing gloves.
- The mix is damp, ideally, to prevent dust (if the mix is very dry, wear a mask to avoid dust particles).
- You wash your hands after handling.
- You wash clothes worn while potting.

It sounds a bit scary doesn't it? Honestly, though, if you're working with potting mix outside, then you're in a well-ventilated area. If the mix is in a bag, then 99 per cent of the time it's damp; if it isn't damp, simply take it back to where you bought it, because it's probably *hydrophobic*, and that means it won't absorb water. When you water your new container plant, the water will just sit on top like a little puddle and the plant will receive no moisture whatsoever. So most of the risk factors are covered.

Potting mix is made of organic materials that are full of microorganisms, including fungi and bacteria, as well as composted pine bark. Added to the mix are minerals and, in some cases, fertilisers. These aren't things you want to either breathe in or let into your bloodstream through a small cut, for example.

In the event of unwanted exposure or irritation and inflammation, here is what you need to do:

1. **Thoroughly wash your hands with soap and water.**
2. **Flush your eyes with plenty of water for ten minutes.**
3. **If irritation or respiratory problems persist, see a doctor.**

Choosing the right mix

With so many potting mix brands on the market, all labelling themselves differently, knowing which one is right for your purposes can be difficult. But they can all generally be broken down into varying degrees of quality. A number of reputable brands of potting mixes are available both in New Zealand and Australia. Within each brand you find a number of different mixes, each catering to the needs of different plants or your pocket.

If the budget is a bit tight, then go for the general-purpose or all-purpose mix. If you have a bit of extra cash, go for the premium mix or a specialised potting mix for specific species. For more information on these types of potting mixes, see the list below.

The quality of potting mixes is also affected by their age and method of storage, especially in the hotter months. You're unlikely to know how old the potting mix is when you purchase it or the way it has been stored, but at least avoid split or damaged bags. And remember, if you only use half a bag of premium mix and leave it sitting in the bag over summer, it will deteriorate. Going for the general- or all-purpose mix presents better value for money for this reason alone.

Before you dash out and buy prepacked potting mixes, however, you may want to consider their sustainability. The main thing to watch out for is whether peat is used in the mix. *Bog peat*, or *peatmoss*, is a non-renewable resource developed in bog marshes over thousands of years. Instead, look for mixes that use *coir fibre*, sometimes called *coco peat* or *coir peat*, a by-product of the coconut-processing industry. You may want to also think about where the mix has been produced and how far it's travelled to get to your place, as well as the plastic bags it comes in. However, if mixing your own (see the next section) is beyond you, you can recycle your potting mix, which I explain a little later in this chapter.

Here are the main types of potting mix on the market:

- **General-purpose, multipurpose or all-purpose mixes:** These potting mixes can be identified by the black standards tick. They're ideal for short-term plants like annuals, or for fast-growing vegies, because they have just a minimal amount of fertiliser added to them to kick the plants off and get them established. So, I guess they contain a short-term fertiliser fix for your plants, compared with premium mixes. You can always add your own homegrown fertiliser, worm wee or finished compost.

(Refer to Chapter 9 for more information on compost and Chapter 10 for all you ever wanted to know about worms.)

- **Premium or professional mixes:** These mixes, identified by the red standards tick, give the very best growing conditions to your plants. They have a greater water-holding capacity than other mixes and contain trace elements vital to your plants' health. These mixes keep giving to your plants over a long period. They are perfectly suited to plants that have a special place in your heart and your garden. Premium potting mixes contain fertilisers that continue to feed your plants for up to nine months, so you need to add fertiliser eventually.

- **Specialty mixes:** These mixes have been prepared to a special formula suited to specific plant species, and will be labelled, for example, as 'Cacti and Succulent Mix' or 'Camellia and Azalea Mix', among others.

- **Seed-raising mix:** If you want to grow container plants, say vegies, from seeds, or take cuttings and propagate your own plants, you need a seed-raising mix (which does the same job for propagating). These specialised mixes are generally low on nutrients because the seed of a plant has all the nutrients it needs and, when combined with light and moisture, will readily germinate. Seed-raising mixes are also very fine and drain freely, promoting root development.

If you want to delve further into what goes into the bag, you need to look at the back of the pack and check the ingredients on the label and how they equate to the ratio of nutrients your plant needs. The most important nutrients are nitrogen, phosphorus and potassium, listed on the bag in table format as the *N:P:K ratio* (refer also to Chapter 2). Here's what that means for potting mixes:

- **N refers to the amount of nitrogen in the mix.** Nitrogen is the nutrient that will make your plant look green and lush. It assists plants with rapid growth, increasing seed and fruit production and improving the quality of leaf crops.

- **P refers to the amount of phosphorus in the mix.** An adequate supply of phosphorus is an essential part of photosynthesis. Phosphorus assists with rapid growth and maturation, flowering and root growth.

- **K refers to the amount of potassium in the mix.** Potassium is responsible for increasing root growth and resistance to wilting and water loss. It assists the plant in coping with drought conditions or excessive temperature variations. An adequate supply of potassium also improves fruiting and fruit quality.

A reading of 9:4:8, for example, tells you that the total nitrogen component is 9 per cent, the total phosphorus content is 4 per cent and the total potassium content is 8 per cent. This means that your plants will be getting a little bit of everything to keep them healthy, strong and robust. Importantly, believe what the bag says it will do for your specific plants. If you're confused by the huge variety of potting mixes, ask your friendly nursery or garden centre guru. They'll set you straight.

The Yates company has an abundance of information not only on their products but about plants and gardening generally. Have a look at their websites, www.yates.com.au in Australia and www.yates.co.nz in New Zealand.

Mixing your own

When gardeners ask me if they can mix their own potting mix, the answer is always a resounding yes, for sustainability's sake. But it can sometimes be an expensive exercise as some of the ingredients can be a bit pricey on their own and need to be sourced from a very good garden supplier or garden centre to ensure quality. This is why many people prefer to buy the ready-mixed and bagged potting mixes.

It is fun to have a go at making your own though, and buying from a bulk garden supplier, if you need to prepare a large amount, should keep the price down. Many recipes for homemade mixes are available, including for seed-raising or propagating, as well as for all-purpose and specialty mixes.

Many potting mix recipes call for ingredients such as river sand and pine bark. To keep your sustainability credentials intact, check that the products you're using have come from sources with

low environmental impact (refer to Chapter 6 for more on sustainable gardening products and Chapter 9 for more on pine barks).

Seed-raising or propagating

Growing container plants from seeds or propagating your own plants from cuttings requires a seed-raising or propagating mix. Seed-raising mixes are low on nutrients (the seed has all it needs), are very fine and drain freely, promoting root development.

A good seed-raising or propagating mix comprises one part coarse river sand to one part coir fibre or one part perlite to one part coir fibre. Whichever one you choose, make sure you mix the ingredients thoroughly.

Perlite is a form of volcanic rock, heat-treated to create very light and coarse granules that allow for air circulation, moisture retention and good root development in seed-raising or propagating mixes. However, it provides very poor anchorage for the emerging seedling, which is why the seedling can only stay in the seed-raising mix for a short time after the first two seed leaves emerge from the plant.

Perlite is very light and dusty. The dust can irritate the lungs and cause coughing, so wetting the perlite, if it's dusty, or wearing a mask, is a good idea. Try not to inhale the dust.

Coir fibre, sometimes called coco peat or coir peat, is a by-product of the coconut-processing industry and a very sustainable product. It's like a huge sponge, absorbing up to eight times its own weight in water. You can purchase it in compressed bricks that, when immersed in water, expand to three or four times the size of the brick.

General purpose

An all-purpose potting mix can be made in a variety of ways. Composted pine bark can be used on its own for orchids. For other plants, you can add coarse sand (three parts composted pine bark, one part sand) and coir fibre (three parts composted pine bark, one part sand and one part coir). You need to wet the coir fibre first or it can repel water in the mix. The coir helps the mix hold moisture and the sand assists drainage. You could also add a wetting agent or some fertiliser like dynamic lifter to any of the recipes; it depends on what you're planning to grow in them.

A potting mix you make yourself can be just as effective as a bought mix. The difference comes down to the convenience of buying a ready-made product versus the effort it may take to make it yourself, and the level of sustainability you want to achieve, of course.

If you don't mind the effort and are feeling adventurous or creative, you can experiment with different ingredients and do your own comparison trials in your backyard. Keep notes on what works best and what is a dismal failure.

No matter what recipe you choose, make sure that all ingredients are thoroughly mixed. Also, when putting the mix into your containers, don't press the mix down, as this will reduce the number and size of the air spaces and make the mix compacted.

Specialty mixes

Many homemade specialty mixes use mushroom compost (from mushroom farms), along with coarse sand and composted pine bark. The mushroom compost retains moisture, the sand assists with drainage and the composted pine bark has the perfect particle size. Some use other ingredients as well, such as coir fibre and perlite (refer to 'Seed-raising or propagating' earlier in this section for more on perlite and coir fibre).

Here are recipes for a few specialty mixes:

- **Azaleas, camellias, blueberries and strawberries:** For a great mix for these acid-loving plants combine two parts potting mix, two parts coarse sand, two parts coir peat, one part leaf litter and a third of a part of aged manure.
- **Orchids:** Orchids grow without soil and most successful growers use aged, untreated pine bark. Try a blend of one part coarse sand and one part medium-grade pine bark.
- **Succulents:** Combine one part mushroom compost, one part coarse sand, one part composted pine bark, one part coir fibre (wetted down) and one part perlite, and mix thoroughly.
- **Tropical plants:** Make a mix using one part mushroom compost, one part coarse sand and one part composted pine bark. This really gives them a kick along.

Recycling potting mix

Sustainable gardeners shudder at the thought of bag after bag of potting mix losing its effectiveness because it has run out of the nutrients that keep your plants healthy and thriving. So what do you do with it? Can you recycle and reuse your expired potting mix? The good news is, yes, you can. Truly sustainable.

Here are a few ways you can revamp your expired and tired old potting mix so that it can be reused:

- **Add the old potting mix to your compost.** The mix assists the decomposition of organic matter and speeds up the whole process of turning waste into delightful humus for your sustainable garden.

- **Use it on your vegie garden.** Spread the old mix over the existing soil and around your vegies. The worms and microorganisms in the soil will soon replenish the nutrients.

- **Incorporate the potting mix into a new garden bed.** When you're turning over the soil, mix in the old potting mix, together with lots of lovely manure.

- **Recondition the potting mix.** Tip it into a wheelbarrow and add some manure and humus from your compost. The manure contains vital nutrients and microorganisms, and assists with moisture retention. The addition of humus introduces even more microorganisms into the revamped mix. Now, put on your gardening gloves and, using your hands, mix the whole lot together, until it becomes a delightful and crumbly combination of different rich materials.

You can use it to either pot up some vegies or for planting colourful annual flowers. The vegies will gobble up the nutrients and the annuals will bear the most delightful blooms. And you can be very smug with the knowledge that you're growing annual species in pots in a very sustainable manner.

Stop agonising over annuals!

As a gardener, you shouldn't feel that planting seedlings is a non-sustainable thing to do. Some sustainable gardeners are quite against annual plants, thinking of massed plants in garden beds and the enormous volume of water these beds can require. Most seedlings in a nursery are annuals. By the very nature of their classification as an annual, they are, in fact, a very clever, adaptable and hardy species.

Annuals complete their whole life cycle within 12 months. That means they germinate, grow, fruit and seed within one year. Most of the flowering annuals planted in Australia and New Zealand are native to hot, dry regions, such as those of Africa, Mexico and South America. They thrive in these conditions and so use water very efficiently. In fact, they don't need much water at all. Think petunias (how tough are they and they flower profusely on very little water); think marigolds, zinnias, cosmos.

Vegies are annuals — carrots, broccoli, cauliflower, tomatoes, peas — the list is endless. They are ideally suited to pots. Pots of cherry tomatoes, pots of peas growing up a tripod. Cauliflower and cabbages growing in pots. Several 'miniature' varieties of these vegetables are available also. The minis are fabulous, I reckon, because they grow just big enough for one or two meals, depending on how many famished mouths you're feeding, of course. Therefore you're always harvesting a fresh, crisp and nutritious product. Farewell to that fridge full of week-old vegies that are limp and pale, with no nutritional goodies.

Somehow (and I know this sounds silly) but, for some reason, no matter how great a vegie gardener you are, small-sized vegies just seem more achievable, and they're ready to harvest in a much shorter period.

One thing to be aware of, though, is that, if a flowering annual is so hardy, it may have weed potential and escape out into your garden, and into next door's garden, where you and, more importantly, your neighbour may not want it. Be observant. Watch for how well the species self-seeds and, if in doubt, visit www.weeds.gov.au in Australia and www.doc.govt.nz in New Zealand (from the Conservation tab, select Threats and Impacts) to check that you're not adding to the weed population. These sites provide current and comprehensive information on weeds and are very informative.

Taking Care of the Essentials: Food and Water

Some people reckon they kill plants, especially potplants. The likelihood is, however, that they simply forget to provide for life's little necessities — food and water. If you're not that keen to have to remember to check your plants' soil and note when you last fertilised them, try keeping just a few prized plants to start with, until you build up some basic plant-feeding habits. And fertilising can come down to an annual event, thanks to the availability of some very convenient fertilisers. So that just leaves the watering! In this section, I let you in on a few secrets to keep your container plants fed and watered.

Feeding your plants

Food for your potted plants is an especially important issue. Container plants don't have the ability to search out nutrients in the surrounding soil and most potting mixes lose the nutrients available to your plants over time, either by being used up by the plant roots or leaching out of the soil through watering. So it's even more important to keep a regular feed routine for your potted plants than for those in the garden. Think of them as being like a bird in a cage, dependent on you for food and water. Regular feeding and periodic topping up or completely changing the potting mix helps to keep your plants happy and healthy. Depending on the plant species, completely changing the mix every couple of years should do the trick. Read on to find out what and how often to feed your plants.

Keep in mind that plants only require nutrients through the growing season. For most plants, potted or otherwise, the growing season is during the warmer months. That is, spring and summer. During this time the soil is gently warmed by the sun, the longer daylight hours triggering the plant into reproduction mode to flower, be pollinated and set seed. This is when the plant is at its most active and needs lots of food to grow — it's a survival mechanism really. So give them a liquid or *foliar* feed (by spraying the foliage) about once a fortnight during this time. You can buy some great prepared seaweed or fish emulsions for this very purpose. Just make sure you always read the directions on the container before applying it to your precious plants. Too much and you could be doing more harm than good.

In warmer conditions, organic fertilisers break down more quickly, giving nourishment to your plants. Rain or watering dissolves organic fertilisers into the soil where they are absorbed by the roots, triggering growth.

What type of food you feed your container plant is a matter of personal choice. Chapter 2 gives some good information on organic (natural) fertilisers, such as humus, manures and worm castings, and inorganic (mineral) fertilisers for your sustainable garden. However, for indoor plants, or a feature container plant on the front verandah, you may not want to have horse, sheep or poultry manure visible on the top of the pot. Outdoor pots can benefit from mulching to retain moisture and you may want to top up your potplants with a very dilute solution of worm wee or worm castings (so it's a very weak tea

colour), especially if they look like they need a bit of a boost. Refer to Chapter 10 for information on worm farms. For most container plants, you can choose from a host of fertilisers that create ideal growing conditions.

Some fertilisers are labelled as 'slow release' or 'controlled release'. *Slow-release* fertilisers are usually in granule form, each granule having a protective coat of sulfur or a type of polymer that gradually breaks down and slowly releases the nutrients the plant needs. *Controlled-release* fertilisers also have a protective coating covering each pellet, sometimes called a *prill*. The difference is that, with controlled-release fertilisers, the nutrient release is triggered by the soil temperature. If the soil is too cold the little prill shuts down and doesn't release as much fertiliser; when the soil temperature warms up, during the growing season, more fertiliser is released, just when it's most beneficial to your plants.

All of the controlled- or slow-release products feed your plants for a set period, maybe three, six or eight months. Controlled-release fertilisers are probably more economical because they don't waste fertiliser over the cooler months.

Many brands of fertiliser are on the market, with different products specifically suited to different plants' needs — roses, camellias, potted plants, annuals. Visit www.scottsaustralia.com.au or www.yates.com.au to find out more about the huge range of products available.

The beauty of these granular and pelletised products is their convenience. Uncomplicated directions on the packet or tub tell you in simple terms how much and how often to apply. They have no odour and are lightweight, so you're not lugging around barrows full of manure or compost all the time.

Soluble fertilisers are also a good option for a rapid boost to your plants, and can be used together with a controlled-release fertiliser, particularly if you want to give the petunias or tomatoes a good kick along with the hope of having an abundance of flowers or tomatoes by Christmas, for example. You can apply a soluble fertiliser every seven days to get the result you want. Just be careful — giving them

one big dose won't work; it might even kill them.

Those with a good memory and time on their hands can use a soluble fertiliser every 7 to 14 days. This involves placing the recommended amount of fertiliser in a watering can with the recommended amount of water, and watering each container. Quite labour-intensive really. Nothing wrong with the product, just the labour required, and I know I would definitely forget to do it.

One thing to remember with all of these fertilisers is that they must be used at the recommended rate for the best result. It is a fallacy and false economy to think that more fertiliser produces better results in plants — flowering or fruiting. The plant can only take up a certain amount of nutrient; anything more is just a waste. Also, too much fertiliser can actually do plants a great deal of harm and reduce flowering or fruiting. I've killed many a plant with 'kindness'. Don't think 'if a little bit is good, even more is better' — this is definitely not the case!

Watering your plants

Another essential component for successful container plant growth is regular watering. First and most importantly, if you're planting directly into a container, or placing an existing potted plant into a new container (refer to the section 'Potting Up Your Plants' earlier in this chapter for a step-by-step guide), make sure that the container has drainage holes. Otherwise, you'll drown your plant, as the potting mix will become waterlogged. Ensure that the drainage holes are a reasonable size — for a large container, about the diameter of a ten-cent coin, and, for smaller ones, about the thickness of a pencil — but not too large or the potting mix washes out of the container with watering.

Don't let your plants sit in saucers of water. Although some plants don't mind, many hate it, so it's best not to get into the habit. Soaking in a saucer of water effectively gives the plant wet feet, as the organic material, particularly bark and coir peat, can act as a wick and the plant becomes waterlogged.

To decide whether or not you need to water your container plant, try the 'lift test' (only if the pot is not too heavy). When you lift up the pot, you can tell if it needs watering by its weight. When combined with soil, water is quite heavy. If the pot feels quite light for its size, then your plant probably needs a drink. Another test is to poke your finger into the potting mix to a depth of 2 centimetres. If it feels dry and the potting mix does not remain on your finger, give the plant a drink. If your finger comes out coated with damp potting mix, your container plant will be right for another couple of days.

You can use a commercially available *wetting agent*, in either liquid or granular form, in your pots to improve water retention. These products reduce the surface tension of the water to allow it to penetrate the waxy surface of the soil particles. If you use the liquid form, take care not to splash the leaves of your plants as it can damage them. Some commercial potting mixes contain their own wetting agent — check the label before you buy.

Reading the watering instructions on the label for your specific plant is important, however, because some plants like to be dry for a period of time and don't need to be constantly kept damp. In fact, some would die if they were. Succulents, geraniums, pelargoniums and many others like dry conditions. Refer to the label if you're unsure.

Finding Room for a Garden

Apartment living and suburban houses with increasingly smaller yards pose a challenge to people who still yearn for a garden or even to grow their own vegies, and container gardening goes a long way to meet that desire. Even inner-city office managers are starting to realise that green is good and are looking for ways to introduce gardens into the concrete jungle. Solutions are at hand, some reasonably simple, such as trellises to grow plants vertically; some stretching the imagination (and the wallet) with whole environments planted on walls or rooftops.

Going vertical with wall gardens

If you're really strapped for space for a flower garden or vegie garden, you can create a vertical garden. Yes, that's right, a vertical garden, plants that are trained to only grow up rather than out!

Trellises, hedgerows, arbours, tripods and so on are all fabulous methods of vertical gardening that suit small spaces. When it comes to vegie gardening and growing vining or rambling crops, vertical supports minimise the amount of space they take up.

Tomatoes, beans, cucumbers, zucchini, watermelon, squash, grapes and kiwi fruit can all be grown vertically, given they receive the necessary support for the fruit. These plants all have spreading and sprawling habits, so they adapt quite happily to growing vertically. And, growing vertically, these crops never lie on the ground and so remain clean and free of slug or snail contamination. Ventilation to the crop is also improved, thus minimising the risk of fungal disease when conditions are humid. The plant receives much more sunlight and the crop is much easier to harvest — no bending down required.

Of course, many, many ornamental species can be grown vertically from pots to create a gorgeous wall of flowering colour. Hardy climbing or twining species such as hardenbergia, wisteria and jasmine produce a very thick screen quite quickly. Pittosporum, photinia and grevilleas are all suitable for screening because of their rapid, lush and bushy growth, together with their hardiness.

You can set up your vertical garden in a number of ways. Some of these methods are cheap, some are very expensive. I start with the cheap methods!

Frames for screening can easily be made or purchased. Lattice is very popular for permanent fixtures, either on verandahs or outdoors (though they may deteriorate after a few years outside). For vegies, frames can be constructed and erected at the commencement of the growing season and then removed when the crop has been harvested. The frame can then be stored until the next growing season, or used for something else.

For outdoor use, metal plumbing pipes are very stable and strong, providing the support that is necessary when the plant begins producing its fruit in abundance. Ensure that the lengths of pipe are long enough, about 2 metres, with a horizontal bar of the same length, depending on what you're planting. The uprights can be attached to

the horizontal bar with metal elbows, available from a plumbing shop. Ensure that the vertical uprights are pushed well into the ground, to a depth of 30 to 40 centimetres at least, to provide strong support.

For horizontal and vertical support within the frame, attach twine, wire or fencing wire. This gives twining plants something to grow on. Keep in mind the plant may need some guidance from you. In the case of tomatoes, you may need to tie the stems to the wire with some soft pieces of material, such as old stockings. Take care with how you secure each stem to the wire to avoid damaging the plant.

If you'd like to try something innovative that will really get the neighbours talking, you may like to install your very own cliff face or tropical mountainside right outside your back door on the verandah or in a courtyard. Now, I must tell you, they are a tad expensive, these whizz-bang gardens, but they really give your house and garden the *Wow!* factor.

You can rest easy on the sustainability issue too, because some of the materials used in their manufacture are recycled, and they are very water efficient. Per square metre they use about 5 litres of water per day — that's about a third of what a conventional garden uses.

Several companies manufacture vertical gardens. These specialist garden providers tailor the vertical garden to your taste and needs, and install it for you.

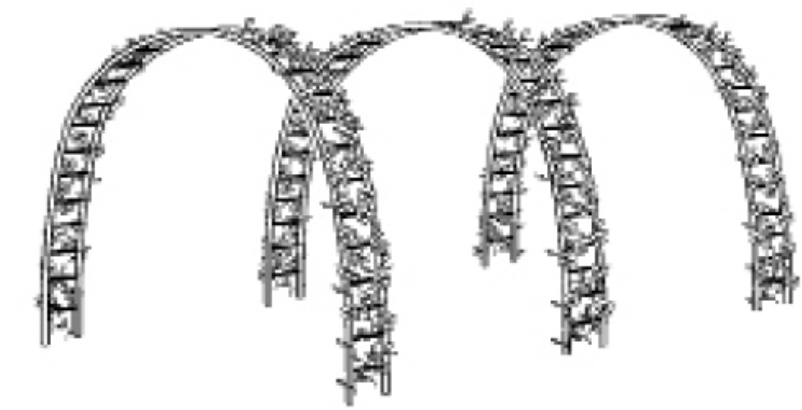
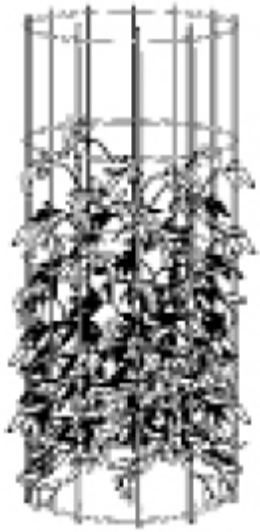
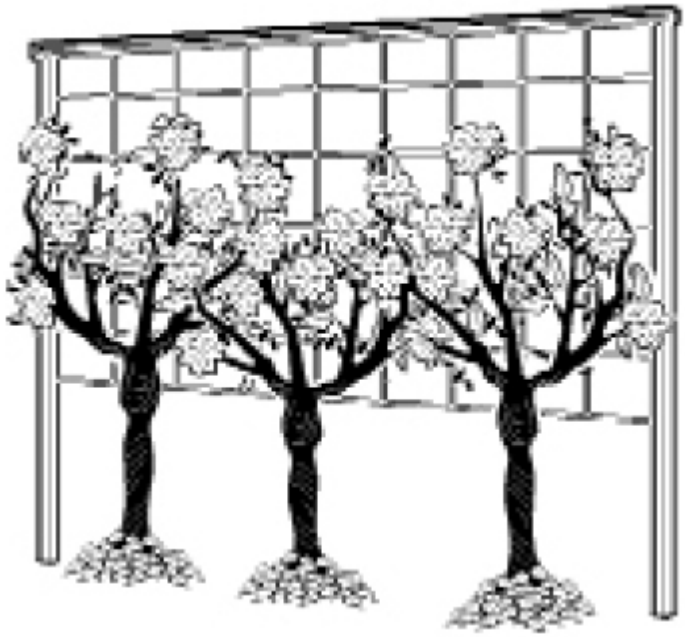


Figure 14-1: Frames for screening or vertical gardening can be made or bought in a range of styles.





The plants in a supplied vertical garden are about 16 weeks old and a hydroponic watering system is included in the cost. The medium the plants take root in is a biodegradable foam that breaks down as the plants mature. One company producing these innovative and striking vertical gardens, Fytowall, guarantees the plants will survive for seven years, but they could easily last longer. The larger the size of your vertical garden, the cheaper it will be per square metre. Prices for a wall less than 10 square metres are between $2,200 and $2,400 per square metre.

Find out more on the Fytowall website, www.fytogreen.com.au. The Greenwall Company is also worth having a look at (www.greenwall.com.au), as is Elmich Australia (www.elmich.com.au).

Looking up with roof gardens

Green roofs on tall city buildings and apartment blocks are becoming

quite popular these days. They are aesthetically pleasing, assisting with productivity in the workplace, they reduce stormwater runoff and can reduce air-conditioning costs.

Many Australian native plants are suited to the conditions on a rooftop, particularly grass species and low-growing perennial and succulent species that can tolerate full sun all day with very little maintenance.

Bear in mind that the development of roof gardens is still in its early stages and is very specialised. Roof gardens are extremely heavy and require that the roof and building construction are able to bear such great weight. Truly a job for the experts, but something worth keeping an eye on just out of interest. Using your roof as a garden certainly maximises the use of available flat space and is another way of combating greenhouse emissions.

Elmich Australia and Phytogreen (check the previous section for their websites) specialise in roof gardens, as well as wall gardens. The Elmich vertical modules can also be used for roof gardens.

Community Gardening

If you live in a unit or apartment and want more than just container planting on your balcony, you may like to consider joining a community garden. Perhaps your backyard is just a little too small for the extensive vegie crop you want to produce. Community gardens are an increasingly popular solution for gardeners with space problems.

Community gardens are public open spaces in your area that have been set aside by local government or your local municipality specifically for people in the community to create a garden, usually a sustainable food garden.

Community gardens encourage residents from all walks of life to learn, share, socialise and participate in gardening activities, using sustainable principles. Most community gardens are governed by a mission statement or policies with a clear vision for the garden formulated collaboratively by as many members of the group as possible.

Community gardens contribute to the health and wellbeing of the community, promote positive social interaction and inclusiveness

between members, and play an educational role in promoting sustainable principles such as:

- Minimising waste by reducing, reusing and recycling resources. Community gardens are creative places; if you ever have the opportunity to visit or be a member of one, you'll be amazed at the creative ways that 'junk' can be used as garden art, fencing, trellising, totem poles, anything really.

- Reducing energy use by members growing and consuming their own produce, thus reducing the 'food miles' of foods that are usually transported from other regions or interstate. People who are motivated enough to be a part of a community garden know the nutritional and ethical value of fresh seasonal produce. Generally these people are willing to share knowledge, ideas and produce as like-minded spirits.

- Minimising water use and wastage, utilising greywater and capturing rainwater. The community garden compost heap is usually large and very productive. Community gardeners know too well the benefits of a nutrient-rich humus and mulching to minimise water use and retain moisture in their soil.

- Aiming to increase the biodiversity of the garden by implementing organic gardening practices to improve soil health through composting organic materials and planting a variety of plant species.

Getting involved: Reasons to be cheerful

Flowers grow in flower gardens

Vegetables grow in vegetable gardens

And people grow in community gardens

Auckland City Council

Community gardeners, particularly in urban areas, come from many and varied ethnic backgrounds. If you're working in a community garden where people have their own plots, rather than working collectively, the plot next to you may be planted out with a huge selection of Asian greens, coriander and water chestnuts. The plot on the other side may be planted out with cooking tomatoes, a bay or olive tree, rosemary and marjoram. The plot behind may be planted

out with spuds and leeks, and the one behind that with medicinal herbs.

An amazingly rich and diverse oasis in a tiny area within a busy, bustling city — biodiversity of plant species as well as the human species! Think what you can learn and share, and how much fun it is.

Community gardeners love to gather and discuss the food they grow and how they prepare it for their families, and are really generous with excess bounty. Often community gardens have a meeting area of sorts — a place to make a cup of tea, have some lunch and a chat. These clubrooms are also used for functions relating to the community garden. Workshops on pruning, planting, composting and organic methods spread the message to all who come along to listen.

Children are encouraged and made very welcome in community gardens. After all, it is your family that you grow fresh, nutritious produce for. Children just love to get their hands into the soil, and the reward in seeing them pick their first tomato or dig up a crop of potatoes is almost unsurpassable.

In the 'instant' world of today, growing vegetables teaches children patience and that some things really are worth waiting for!

Starting your own!

Starting your own community garden probably sounds pretty daunting; however, if you don't have an existing community garden nearby, the best way to kick off the idea is to get together a group of like-minded people and toss around the idea.

To find out where your closest community garden is in Australia, check out the website for the Australian City Farms and Community Gardens Network at www.communitygarden.org.au. If there isn't one in your area, you'll get good information on how to start your own. In New Zealand, get onto your local council to find out about starting a community garden, or check out www.communitygardenz.org.nz.

To establish a community garden, the first thing you and your like-minded friends must do is find an area where you can garden. Look around your locality, paying special attention to unused and unkempt

public open spaces.

Make a list of each potential site, noting:

- Size of the site
- Existing buildings or trees
- Proximity to housing or public transport
- Whether it's a windy or sheltered position

Next, put some ideas down on paper relating to the whole idea of a community garden and what you all hope you can achieve by having one.

Contact your local council to discuss the whole concept, and hopefully they'll think it's a fabulous idea and offer an area and other assistance to kick-start the project.

Most councils have a policy on community gardens that gives you guidelines on the process and how your proposal is assessed, usually on a case-by-case basis. You need to put in all the paperwork the council needs and in the format it requires. After you've sussed out what you have to do to get your community garden going, a good start is to put together a community garden management plan. A plan that shows a solid foundation and vision helps to get your project off the ground.

School gardens

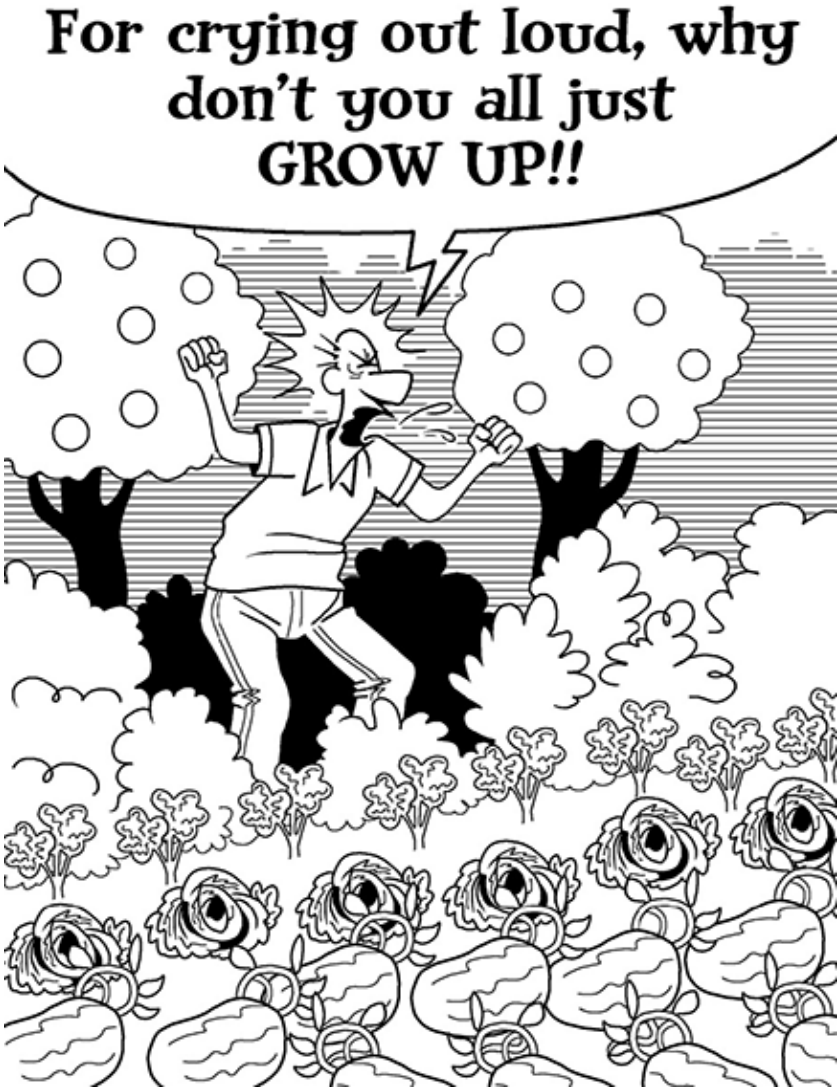
A sustainable school garden is a great way to introduce kids to the joys of gardening and growing their own food, when frequently, at home, gardening may not be high on the agenda. The popularity of school gardens has boomed in recent years, with a range of fantastic programs being rolled out across Australia and New Zealand in both primary and secondary schools.

Not only do kids learn about gardening, their activities in their patch of dirt can be linked to many other areas of the curriculum. It's a great way to get kids in touch with nature and the world around them. Ideally, school gardens shouldn't be separate to everyday teaching, but should be a sustainable outdoor classroom.

Part V

Other Schools of Thought

Glenn Lumsden



Harold liked to talk to his plants.

In this part . . .

As with many aspects of life, gardening enthusiasts, even sustainable gardeners, have different points of view, philosophies and methods.

In this part, you get to explore some of these other schools of thought.

Organic gardening these days has widespread acceptance, especially in sustainable gardening circles. And some gardeners extend the organic gardening concept to include permaculture principles; and others, biodynamics.

I'm not an expert in any of these philosophies; rather, I take bits from them all and apply them to my sustainable garden. Explore these ideas and work out what best suits your situation and personal philosophy.

Chapter 15

Organic Gardening

In This Chapter

- Understanding organic gardening and sustainability
- Finding out what makes food organic
- Looking at heritage varieties and food biodiversity
- Getting your community involved

Perhaps the terms 'sustainable' and 'organic' are interchangeable, because an organic garden is one that sustains you, physically, emotionally and spiritually. It provides for you now but also looks after future generations, because organic gardening is about preservation of all sorts of things — the soil, the atmosphere, waterways, and food and plant varieties.

This chapter looks at some of the imperatives of organic gardening — just what makes a garden, or its produce, organic. I also take you through some of the practical aspects of organic gardening, such as how to kill weeds without chemicals. And I discuss organic food and plant biodiversity, and just why more and more people are joining the organic gardening movement.

What Exactly Is Organic Gardening?

Simply put, *organic* gardening is the cultivation of plants, especially fruit and vegetables, without using chemical fertilisers or pesticides.

American author and publisher J. I. Rodale, who founded and published *Organic Farming and Gardening* magazine, was the first to use the term organic, way back in the 1940s. Rodale believed that the use of chemical fertilisers and pesticides was extremely damaging to the environment and its precious and fragile ecosystems.

In those early days, the introduction of the internal combustion engine had brought along with it the fantastic tractor. Farmers were now able to mechanically cultivate, sow and harvest thousands of hectares at a time rather than just hundreds. Mass cultivation brought about mass destruction of habitat and reduced biodiversity. Lack of biodiversity makes for a nasty pest paradise. So along came some even nastier chemicals (many now banned) to combat destructive pests decimating crops. To top it off, synthetic fertilisers were developed to keep the thousands of hectares of crops growing as fast as possible to feed the ever-increasing world population. The fertilisers fed the crops well and the pesticides killed the bugs for a bit, until they developed resistance, of course; but neither did anything for the precious foundation material, the soil, which began to suffer from malnutrition.

Rodale promoted the return to the use of natural substances such as composts and manures as being a much more productive way to enrich crops and gardens, also utilising old-fashioned methods such as crop rotation to minimise pests and diseases. Organic gardening is a holistic and ecologically balanced method of managing gardens and farmland, without the assistance of artificial chemicals and fertilisers. I guess you could call that sustainable.

Isn't sustainable and organic the same thing?

To a point, sustainable and organic gardening are much the same. However, in your sustainable garden, chemicals are not strictly forbidden. You may use some chemicals to control weeds, for example. In essence, an organic garden is a garden where no synthetic fertilisers or pesticides are ever used.

Organic gardening is almost a philosophy and becomes more than just gardening; it becomes a way of living that treads lightly on the Earth and leaves it in a better state than it was found.

Working in harmony with nature

Organic gardens work in harmony with nature, not against it. They help to keep the environment healthy by avoiding harmful chemicals and synthetic fertilisers, which escape from the garden into creeks, rivers, lakes and oceans, and into your soil and the air you breathe.

An organic garden is a garden rich in nutrients, biodiverse flora and fauna, and life! The basis of organics, like any sustainable gardening practice, is building and nurturing the soil.

Organic gardeners, like sustainable gardeners, understand the importance of the soil as the building block to a healthy, productive garden. Regularly adding organic matter to the soil replenishes what your plants use. The key is compost, the ideal organic matter. If you regularly add the finished humus from your compost, you're replacing the food your plants take out of the soil. Understanding the type of soil in your garden will set you on your way to managing it organically. (Refer to Chapter 3 to find out how to analyse your soil and Chapter 9 for information on compost.)

Healthy soil equals healthy plants. It's that simple!

Working with weeds

Even in a harmonious, natural organic garden, unwanted guests can still appear. Your wonderfully rich and fertile soil is also an inviting place for weeds to take up residence. One of the trickiest dilemmas in an organic garden is how to control weeds. Sure, if there are only a few, you can yank them out by hand, or scrape them out with a hoe.

To take on a large infestation, organic gardeners use some or all of the following methods:

- **Mulch, mulch, mulch:** A thick layer of organic mulch deprives the weeds of light and air, smothering them. The more persistent weeds can be smothered with cardboard or thick layers of newspaper.

- **Dig them out:** A hoe or other sharp tool can do the job. Just remember, when you use this method, you need to know the weed you're removing. Some weeds have huge tap roots and cutting off the root only causes it to sprout again.

- **Solarise them:** If you can leave the area fallow over summer, pull out as many weeds as you can, and then dampen the soil and cover it with clear plastic weighted down with some rocks or old

bricks. Leave it for six weeks or so and then, when you take off the plastic, the sun will have cooked the weeds and any seeds that may have been dormant in the soil.

- **Use a weed flamer:** This method is for paths, and employs a propane- or kerosene-fired torch mounted on a wand. The flame heats the sap inside the plant, causing it to boil, which collapses the plant tissue. The weed then basically wilts and dies. For more information on this method of weed control check out www.gameco.com.au.

- **Be persistent:** It pays off. Just keep at 'em and you'll conquer the weeds in the end.

- **Tolerate them:** If you can't beat 'em, live with them. Organic gardeners often tolerate some less invasive weed species.

Living with bugs

Okay, you may control weeds using these methods, but what about pests? How do organic gardeners manage that one without nasty chemicals? Back to the basis of organic gardening — working in harmony with nature. Not all insects are bad guys, and organic gardeners get to know the insects in their gardens and understand the balance of good and bad bugs. They encourage natural predators of the bad guys by planting a diverse range of plants and providing a nice welcoming home for the good guys.

Organic gardeners use things like pheromone lures and sticky traps that trick and trap the nasties, leaving the good bugs happy and safe. Netting and plant collars are some good physical barriers to pests that won't harm your plants. (Refer to Chapter 8 for more about these pest control methods.)

Even in a well-managed organic garden, sometimes the bad guys move in en masse. If that happens, an arsenal of natural organic products that will defeat the invaders without harming the environment are at your disposal. Insecticidal soaps, horticultural oils and various natural concoctions use things like garlic and rhubarb that are lethal to some pests.

Bacillus thuringiensis (Bt) is a naturally occurring bacteria common in soils and organic waste. It's a stomach poison for most

caterpillar species, and commercially it's sold as Dipel®. You just mix it with water as per the directions on the package and spray it onto the foliage of the affected plants when the caterpillars are actively feeding. Within five days they'll be dead. As the *Bt* breaks down in sunlight, you may have to spray again in case you missed any caterpillars, but, as it's safe for mammals, bees and beneficial insects, you can spray with confidence.

What Is Organic Food?

Organic food is produced without the use of highly toxic, persistent chemicals or quick-release soluble fertilisers. However, naturally occurring pesticides that are not damaging to the environment can be used. Organic food production essentially uses gardening or agricultural methods that have a low environmental impact and encourage a large range of plants. Sounds very sensible and sustainable.

Organic food is reported to be more nutritious and better tasting than food grown using more conventional methods. Do a taste test and decide for yourself.

Commercially grown organic food must be certified as being genuinely organically grown to make that claim. Some strict rules govern the certification of producers and their right to use the various logos on their products. These rules stipulate continual, rigorous testing of soils and compost. Growers must also keep accurate records of everything they put into their produce and make sure at all times that what they grow is free from any sort of contamination. Phew! Sounds tough. So you might wonder why people bother to produce food organically.

Organic food producers genuinely care about what people eat and how food production affects the environment and the long-term health of the planet. Good on them. I for one want to make sure they keep doing it. If you can't grow enough of your own organic produce, you need to support those who do, so they can keep doing it. Let's face it, not everyone can grow everything for themselves, even though I'd love to have an organic chocolate farm at my place. (Or perhaps an organic lamb farm specialising in organic lamb infused with homegrown garlic, with a fresh mint sauce glaze and surrounded by golden organically grown roasted potatoes.)

The Australian Quarantine and Inspection Service (AQIS) is the

Australian government authority responsible for overseeing the organic certification system. Australian Certified Organic (ACO) is the largest of seven certifiers of organic and biodynamic produce. Figure 15-1 shows ACO's logo, along with those of the National Association for Sustainable Agriculture (NASAA) and Organic Growers of Australia (OGA). These are just three of seven organisations that certify organic produce in Australia. Any Australian grower wanting to export their organic produce must have their products certified.

Figure 15-1: When you're out shopping, look for these logos, among others.

In New Zealand, BioGro is the leading organic certification agency. It has developed organic standards specifically for New Zealand producers over 25 years, and provides auditing and certification services. You can be sure that if

a product carries the BioGro logo (shown in Figure 15-2) it's been rigorously tested and is guaranteed to be organic.

Figure 15-2: In New Zealand, BioGro certifies organic produce.

Preserving Food Biodiversity

In addition to growing food without the use of nasties, a big part of organic gardening is to grow *heritage* varieties of food as much as possible. These varieties have been passed down through generations, rather than being bred or hybridised.

The diversity of the world's food crops is diminishing. In ancient Roman times, about 23 apple cultivars existed; in 1900, the number of apple varieties grown in the world was over 4,000. Today, half of those have disappeared and the other half is endangered. In Australia today, for example, less than 50 apple varieties are grown and only about 10 of those are grown commercially, for the simple reason that they can survive up to eight months in cold storage. This is what is called

fresh fruit in supermarkets. If consumers insisted on eating only those fruit and vegies in season, maybe the range of apple varieties would increase.

Some strawberries are even in danger of extinction. These days, strawberries are bred and grown for storage, size and ease of transportation. Often they're picked before they're ripe, so the wonderful sugar has not developed. What you end up with is a big plump colourful strawberry without the sweetness of the sugar that gives it that delicious flavour.

One of the keys to organic gardening, and sustainable gardening too, is to preserve the biodiversity of food crops. To grow heritage varieties of food plants is to keep alive the huge array of food we used to have.

In January 2005, Dr Charles Benbrook from the Organic Center in the United States released the results of his research into antioxidants contained in organically grown food. He found that organically grown food, in 13 out of 15 cases, had higher levels of antioxidants compared with food grown conventionally; that is, using chemicals. He also reported that several other studies conducted found levels of specific vitamins, flavonoids or antioxidants in organic foods two to three times higher than in matched samples of chemically grown food. Other studies aren't so positive about the nutritional benefits of organic food, but really it comes down to personal choice.

It's a Community Thing

Organic gardening is catching on as a great community-building initiative, through neighbourhood backyards, community gardens and schools. School gardens, in particular, are becoming more and more popular as parents and teachers see the benefits of kids having organic gardens as an extension of their classroom. To learn more about community gardens and school gardens, refer to Chapter 14.

Some great programs in both Australia and New Zealand encourage communities to understand and appreciate the natural environment, gardening, outdoor activities and healthy food choices using organic gardening principles. Programs like these help bring communities

together and help people to understand where their food comes from and the impacts some conventional growing practices may have on the environment.

Chapter 16

Permaculture

In This Chapter

- Understanding how permaculture came about
- Finding out what makes it different
- Designing your permaculture garden
- Checking out sheet mulching
- Watching your water
- Letting you in on a few secrets

For a lot of people, permaculture is a practice that they vaguely understand but seems, at first glance, to be very involved and a bit overwhelming. However its basic premise is much the same as organic and biodynamic gardening, which I also cover in this part. It's all about living in a sustainable manner by minimising your negative impact on the environment and maximising your potential to live in greater harmony with your environment. It's about taking responsibility for how you impact on the environment, understanding that you are a custodian for future generations.

In this chapter, I explain just how you do that through permaculture. I talk about designing your garden through analysis and the use of zoning, the practice of positioning the elements of your garden, like vegie patches and chook pens, where they're best utilised. And I get down to the nitty-gritty of sheet mulching and efficient watering systems, along with my pet permaculture tips.

Creating a Permanent Culture

Aussies have a claim to fame for this sustainable practice. It was 'invented' in the mid-1970s by Bill Mollison and David Holmgren. These guys desperately wanted to create stable agricultural systems. They could see that large-scale, interventionist and destructive

agricultural methods were decimating the soil, water and biodiversity of the environment through blind and neglectful overuse of fertilisers and pesticides, and practices of deforestation and *monocultural* plantings; that is, large areas with just one crop. Nothing sustainable about that.

From this came the design principle of *permaculture*. Originally it meant 'permanent agriculture', but these guys were ahead of their time and realised that this whole permaculture thing involved a complete turnaround in thinking about the way people interact with the planet. Social conscience played a huge part in the theory. So permaculture actually means developing a 'permanent culture'. Beautiful, really.

This sustainable practice grows on you, because it's all about the food chain, life cycles and that sort of thing. Although we human beings are at the top of the food chain, our existence is dependent on the tiniest microbes in it. Smallest is greatest. In fact, microbes in the soil eat more than the entire human population eats. Believe me, smallest is greatest.

What Makes Permaculture Different?

Well, the obvious, it was invented by Aussies so it's gotta be good! No offence to those of you across the ditch. Maybe on face value permaculture reflects that 'she'll be right, mate' Aussie attitude, because permaculture gardens can look a bit messy; in fact, they can look downright chaotic, but don't worry, she'll be right, mate. You see this seeming chaos has a reason.

One of the main premises of permaculture is that permaculturists understand that bugs are smart. When bugs and pests see a huge crop of just broccoli, or just cabbages, or tomatoes, they round up all their buddies, have a huge feast, breed like billyo and that's the end of your lovely winter vegies, or summer tomatoes. The bugs don't care that you had planned to vine-ripen those tomatoes and turn them into semi-dried tomatoes to have on your bruschetta one balmy summer evening!

Permaculturists play mind games with the bugs in an 'us and them' scenario. Permaculturists understand that most ecosystems support a variety of plant and animal species, not monocultures. Planting a

variety of species not only confuses the pests, but the combinations of plantings actually support one another in healthy growth and food production, sort of like companion planting (refer to Chapter 8), except that in permaculture it's called *guild planting*.

Guild planting mimics what happens naturally. Natural ecosystems have species that use slightly different resources within the ecosystem, so there is plenty for all. They're all buddies; no one species is hogging everything. Also, they grow differently. The taller species, needing more direct sunlight, protect the little short guys, who may be a bit light-sensitive, or need their roots shaded.

Pests and bugs are not as prevalent because finding enough of what they like among all that variety isn't worth their while, and some plant species actually repel pests, so a symbiotic relationship starts happening — you scratch my back and I'll scratch yours! Guild planting also keeps the soil covered with plants all of the time, so weeds just don't get a look in. Good for you, too, in your sustainable garden, particularly the vegies, because it means you always have a staggered crop of something throughout the year.

Sustainability by Design

Modern permaculture is a system design tool. It's a way of looking at a whole system or problem, observing how all aspects relate to each other and fixing the parts that don't work, with a view to creating a sustainable system that does work. Permaculture can apply to redesigning the smallest item in the house to the largest component of a garden or farm.

Putting your site through analysis

Permaculture guru David Holmgren advocates site analysis as the best way to get your permaculture garden off the ground. The process of site analysis involves several steps:

1. Observe your garden, really look at how it works within itself.

If you have the patience, do this over a year. In that period you get to see how your garden reacts to the seasons, which parts are boggy in winter, which parts are rock hard in summer, which parts are damp, shady, windy or exposed all year round.

You may get some surprises popping up throughout the year, daffodils in spring, naked ladies in autumn, jonquils in winter — who knows — the garden is full of surprises.

2. Think about boundaries, fences, sheds, paths, council regulations, and your hopefully friendly and supportive neighbours.

Consider how these things impact on your garden, and on your future gardening plans.

3. Realistically take into account your resources, such as money, people to help and resources you want to produce yourself.

Consider what you want as ongoing features of your sustainable permaculture garden, such as humus from a compost heap or vermicasts from a worm farm. (Refer to Chapters 9 and 10 for more information on both of these beneficial additions to your garden.) And be realistic about how much time (and money) you have to spend in the garden, and how many hands will be there to work it.

4. The next step is to formulate your plan or design.

Take into account the site and its physical constraints, your resources, and future maintenance needs. And, of course, the more sustainable your garden is, the less maintenance it requires.

Then the fun really starts, when you get stuck into it and get physically working. Yahoo! But first I look at another aspect of permaculture site analysis, zoning.

Zoning in on your backyard

Thinking about the design of your permaculture garden may make you feel a little overwhelmed. But Mollison and Holmgren, the fathers of permaculture, break the whole thing down into more manageable pieces, or what they call *zones*, literally different areas surrounding your house that are designed for different purposes, with up to six zones in a full-blown permaculture environment. Considering your backyard in zones certainly helps to focus on what goes where and why!

Zone 0 is your home; that is, the actual house. All of the remaining zones are placed around Zone 0 to require minimum inputs, gain the highest yields, be time-efficient for you and maximise your ability to recycle.

Zone I is the home kitchen garden. You need it nice and close so you can duck out to pick the lovely fresh parsley for your omelette or the rosemary for the Sunday roast and, of course, a few cloves of garlic to slip into slits in the leg of lamb to make the meat beautifully flavoursome. And don't forget the fresh mint for the sauce to go with it. I've got a great recipe for mint sauce — oops, I'm not writing a cookbook, am I? But I have to tell you, a good leg of lamb is one of my weaknesses, and the organic, sustainable, permaculturist meat-lover that I am can't resist one. But you get the idea — keep the herbs, silverbeet, tomatoes, peas and so on — food items you use on almost a daily basis — close to the house. Zone I is also the spot for your worm farm, so that after preparing the vegies for dinner you can nip out and dispose of the peelings.

Zone II is intensively planted with vegetables and fruit trees, and heavily mulched. This area also contains your compost heap, the chook shed and pens for any other small animals, maybe ducks, guinea fowl, guinea pigs or rabbits. You also visit this zone on a daily basis to collect beautiful fresh eggs and feed the whole menagerie. This is also where I'd put the clothesline, because I seem to visit it so often. All this looks pretty time-efficient, because you can do a lot in one trip — hang out or bring in washing, feed chooks and collect eggs, and then collect the vegies and herbs you need for dinner on the way back. Of course, not many true gardeners actually do this because they always get waylaid. They like to marvel at how much the beetroot has grown in the last 24 hours, or how quirky and individual each chook is, or comment on the delightful fragrance of the 'Double-Delight' rose at the back door — and, before you know it, a short trip to the henhouse has turned into an hour and, oh, the washing is forgotten. Such are the simple joys of your garden!

Zones I and II ideally should reduce your reliance on supermarket-bought fresh produce. They also help to reduce your household and garden waste because it goes to your chooks or rabbits, or to your compost or worm farm to provide you with soil-enriching compost and worm castings to feed your garden.

Zones I and II also provide health benefits to you and your family, and bring the admiration of friends and neighbours, because you are eating, sharing and preserving the very best of seasonally homegrown produce. Your children are outside more often, engaging with the poultry and other small animals, and harvesting crops — fabulous!

All this outdoor activity, of course, means you'll have lots of dirty garden clothes but do try to resist the temptation to wash them continually, even if you're a super-hygienic clean freak. Instead, use designated old gardening gear that can stay a bit muddy, and gumboots, or wellingtons, and some waterproof overpants that can be left near the back door, if muddy, messy clothes really get to you. Set up an old basin under an outdoor tap, with soap and a nailbrush, and a tin cup for when you or the kids get thirsty. You don't want children tripping sludge into the house every time they need a drink, and everyone knows water tastes best straight from the garden tap!

For the average suburban-size garden, probably Zones I and II are about all you'll be able to physically contain. If you're fortunate enough to have a bit more land, you'll be able to incorporate Zone III into your site.

Zone III is the area that requires less maintenance, hurray! Here you may have hardier species that are self-propagating. A larger orchard containing fruit and nut trees, perhaps larger animals such as goats, geese or sheep. You may also have a propagating area here so you can grow vegies or other plants from seeds or cuttings you collect or that are given to you by like-minded neighbours and friends.

An even larger site would have room for Zone IV, which may contain a small herd of cattle, a mob of sheep or pigs. Growing a woodlot and staggering the planting over a period of time is a great way to be self-sufficient in timber, and a marvellous way to encourage and increase native flora and fauna to your site. Fodder plants or pasture may also be in this area.

Zone V is the conservation zone, preserving and maintaining indigenous plant and animal species, soils and waterways. It is, in fact, your own personal flora and fauna reserve.

Permaculture can be on whatever scale you want it to be, depending on the size of your place. You're probably already formulating plans in your head as to how you want to zone your property. But, before you make the final decision, remember that the path of the sun in winter and summer, and the prevailing wind and rainfall at various times of the year, are also important factors in

determining the ideal location for each zone.

You may live in an area prone to extreme weather events, such as flooding, cyclones, blizzards, rising sea levels, bushfires or heatwaves. They don't happen every day, but every day you hear that weather patterns are changing and that the frequency of extreme weather events will increase. You need to bear in mind the potential for extreme weather events in the future.

Building a Permaculture Garden Bed

As with all gardens, a permaculture garden starts with building up your soil. And, before you complain about more back-breaking repetitive digging and incorporating manure, with permaculture, your aching back is saved. Clever people the permaculturists — they came up with *sheet mulching* to produce a no-dig garden bed not dissimilar to the one I describe in Chapter 12. You just cover the area you want to plant into with just about anything — except black plastic — you don't want to kill off all the microorganisms in the soil! But first, it does involve a little preparation:

1. Mow the area down low, leaving the weeds and clippings on the ground.

2. Thoroughly wet the entire mown area and then dust it with some lime.

The lime sweetens the soil and assists in breaking down the clippings.

3. Soak old newspapers, carpet underlay or cardboard in a large container, such as a wheelie bin or wheelbarrow. When completely soaked, lay this over the entire area.

You'll need a thick covering, one layer of underlay, but maybe eight to ten sheets of newspaper, or one or two layers of cardboard, depending on its thickness.

4. Cover this with a good layer of old hay or aged grass clippings to about 10 centimetres deep.

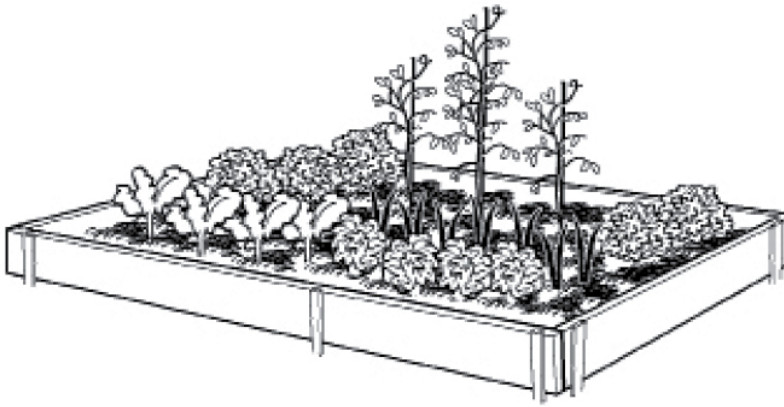
5. Add a layer of rotted manure or compost to a depth of 10 to 15 centimetres.

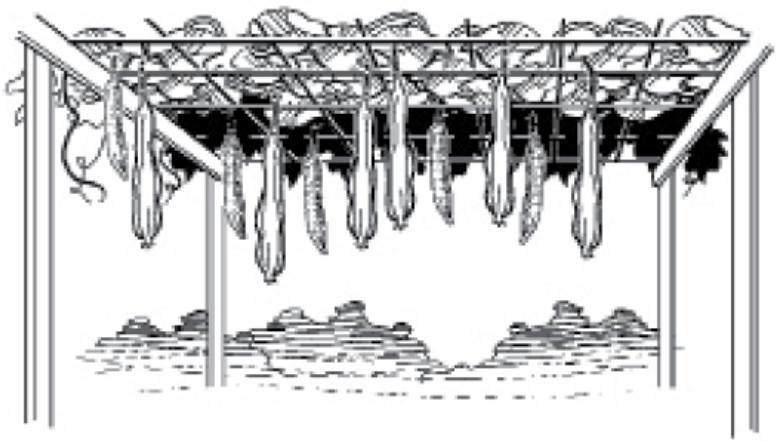
6. Follow it with a layer of nice clean mulch, such as pea straw, sugar cane mulch or straw.

That, folks, is sheet mulching, and what a beautiful, nourishing bed for your vegies and herbs it produces.

In permaculture, beds can be designed in a number of styles, depending on the characteristics of the plants to be grown there — different heights, shorter or longer harvesting times, different light or heat sensitivities, annual or perennial crops. Spiral beds, keyhole beds, clipping and plucking beds, narrow and broad beds, beds for trellis plants and vertically growing crops. Check out the variety shown in Figure 16-1. The different species are planted in such a way that they help each other achieve their healthiest and most productive growth, and supply you with a bountiful yield.

Figure 16-1: Different types of plants benefit from different styles of beds.





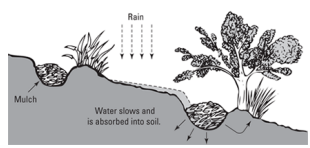
Watering Your Permaculture Garden

Conserving water is another thing that matters to permaculturists. How many times can you reuse your water? Permaculturists advocate the use of greywater (water from your bathroom and laundry — refer to Chapter 3) on the garden but many schools of thought exist on the safety of this practice. At the end of the day, you must abide by your council's by-laws. You also need to be careful with the amount of detergent and resultant salts that may accumulate in your soil. Having achieved the perfect soil, you don't want to wreck it with poor-quality water.

Apart from the use of greywater, permaculturists also advocate a number of other practices. Water should be trapped within your boundaries, with no water escaping your property as runoff. So, it has to be stored, but how? The obvious answer is in tanks or water barrels used to collect rainwater from your roofs. However, clever permaculturists employ other methods as well.

First, the soils in a permaculture garden are so well structured and heavily mulched that most rainwater is held in the soil and mulch. Excess water on the ground can also be used and stored in *swales*, which are particularly useful on sloping sites. Parallel ditches are dug horizontally along the slope — the steeper the slope, the closer the swales should be. Swales stop the water as it flows downhill, giving it the time it needs to soak into the soil, as shown in Figure 16-2. Anything that overflows is caught in the next swale down the slope. Swales vastly improve your soil's water retention, but will, over time, also help to replenish the water table.

Figure 16-2: Swales not only help water retention in your garden but, in the long term, also help the water table.



Sharing a Few Permaculture Secrets: Don't Tell Anyone!

Many permaculture gardeners have their own favourite little secrets, which they may or may not share with you. But here are a few favourites of my own that might save you some heartache, time or money.

Even in a backyard garden, crop rotation is really useful in maximising production and minimising dreaded pests. Changing where you plant things each year really confuses bugs and prevents a depletion of the

same nutrients in the soil. Generally, vegies are rotated on this basis. Follow crops of legumes, such as beans and peas, with brassicas, such as cabbages, broccoli and yummy brussels sprouts. Then try fruiting crops such as tomatoes, strawberries, capsicums and cucumbers. Next season, go for onions, leeks and garlic. The final crop should be the root vegies, such as spuds and carrots, and then around you go again.

As far as watering goes, in your Zone I garden (refer to the section 'Zoning in on your backyard'), you need only water when the soil is dry down to your second finger joint. This test is the key. Actually bending down and feeling whether the soil contains moisture is the most effective way of deciding whether to water or not. Often, what looks dry really isn't and, if you've mulched properly, watering is absolutely minimised.

The idea of companion, or guild, planting is also very beneficial (refer to the section 'What Makes Permaculture Different?' earlier in this chapter and Chapter 8 for a useful table of companion plants). Many plant species help other plant species. They're mates in the garden and you want lots of mates in yours to keep your plants chirpy. Companion plants such as legumes can be *nitrogen fixing* — great at putting nitrogen back into the soil for improved growth of the friends around them. Companion plants can also encourage healthy microorganisms in the soil and improve soil texture, thus assisting root development in plants and making the worms' job easier. Some companion plants attract good bugs, such as beautiful ladybirds to eat aphids and hover flies, and bees to pollinate your fruit trees, pumpkins and so on. Retaining and increasing indigenous plants will preserve and improve the habitat of local flora and fauna, and help maintain the biodiversity of your local area.

Think outside the square; utilise each area in your garden in more than one way. Planting passionfruit on the wire of the chook run gives your chooks a little shade, and you can pluck the fruit when you collect the eggs. Let the chooks out to scratch and poo around the place, but be sure to cover up your seedlings. Use temporary shelter, such as shadecloth stretched over a frame of garden stakes, to protect young seedlings or plants not coping with warmer or extreme weather conditions. Planting herbs around your clothesline makes the washing smell divine — much better than fabric conditioners — and you can pick your herbs when you put out the washing.

Create little micro-climates all around your garden. Introduce rocks and water (but first check out Chapter 6 for information on using sustainable landscaping products). Rocks are great for lizards to bask on, and frogs love bogs and ponds of varying depths. You'll have the time of your life creating and sharing your creation with family and friends and, best of all, having a Garden of Eden just outside the back door.

Chapter 17

The Biodynamic Movement

In This Chapter

- Understanding the core of biodynamics
- Getting familiar with some of the preparations
- Managing your garden with biodynamics

No book on sustainable gardening would be complete without a chapter on biodynamics, an intriguing system of holistic organic agriculture that can attract mixed opinions. Some people scoff at its practices, but I have met many gardeners, winemakers and farmers over the years who swear it works.

Personally, I've only ever added the odd bit of biodynamic soil preparation to my garden, so I can't really attest to its advantages. However, this international movement is backed by serious research and has government-recognised accreditation systems in place in both Australia and New Zealand.

So what is biodynamics and does it have anything at all to do with your sustainable garden? You could say it's an alternative school of thought, practised by devotees who swear by its effectiveness in culturing soil to benefit plant and animal health, and, consequently, human health as well.

Perhaps you've heard bizarre whisperings relating to the practice of biodynamics — planting by the light of the moon, mixing toxic-smelling substances in large cauldrons, filling cow horns with manure and burying them in the garden when the moon is waxing. Well, you'll be pleased to know that all of this is true! Better yet, there's a whole lot more as well, and in this chapter I look at just a few of the core biodynamic practices.

How the biodynamic movement came about

Biodynamics draws on the work of Dr Rudolph Steiner (1861–1925). Steiner is well known in the field of education, and many Steiner schools exist around the world. What is generally not known is that Steiner had some very interesting theories relating to regenerative agriculture. Using a holistic approach, farmers and gardeners use the forces and substance of nature to bring about sustainable food production. Biodynamic farmers and gardeners care deeply about the environment they manage.

In Australia, experimentation with the biodynamic method continued after Steiner's death and began to be used by farmers from the early 1950s. Biodynamics was first practised in New Zealand at Havelock North in 1928.

The Essence of Biodynamics

At the heart of the practice of biodynamics is what is known as the *preparations*, which are produced from plant, mineral and animal substances. Practitioners believe that application of these preparations, ideally in spring and autumn in accordance with the Earth's rhythms, result in optimum growing conditions, produce and sustainability.

Sounds tricky and elusive doesn't it? And, to be honest, taken on face value, it is. This method of sustainable gardening takes commitment and a fair degree of curiosity and experimentation, and patience. The biodynamic preparations are used to bring life and fertility to the soil, increasing microorganisms, bacteria and friendly fungi. This produces a delicious soil concoction to delight anything you may want to grow in your sustainable garden, whether it be edible produce or beautiful blooms to admire.

The Mysterious Preparations

The preparations that are the basis of biodynamics all have a specific purpose and have some quite peculiar names, such as Horn Manure Preparation 500, Horn Clay Preparation (summer or winter version), Horn Silica Preparation 501 and Compost Preparations 502–507.

The central concept of the traditional preparations is to develop a rich humus-like product, using substances like, funnily enough, manure, clay and quartz. For the horn preparations, these are packed into a cow horn, which you can pick up at an abattoir if you have one

handy, and buried over a season — the names don't sound all that silly now, do they? Over the maturation period the manure, clay or ground quartz in the horn reacts with microorganisms in the earth to produce the preparation. This end product is then mixed vigorously with water and applied to your garden, either to the soil or as an atmospheric spray.

Really, the trickiest part is remembering to pick up the cow horns when you do the shopping! Horns are made of silica, just like your fingernails, and selecting horns from a cow and not a steer is important. Inside a cow's horn, etched into the silica, are spirals. These spirals create a vortex, which is what practitioners of biodynamics try to replicate when they stir those preparations so well.

This stuff is extremely potent, so you don't need very much — for some preparations just a couple of grams of the humus diluted in water is enough for an average home garden.

Because you need only a very small amount of the preparation to a fairly large quantity of water, quality water is essential for the preparation to do its work properly in your sustainable garden. Preparations need pure water, free of chlorine, fluoride or other pollutants; ideally, rain or spring water. If using bore water, ensure that it's free of iron, aluminium or calcium contamination. In colder regions, some farmers even heat the water to body temperature. Depends how far you want to go I suppose.

If it all sounds too complex, Biodynamic Agriculture Australia has a product list, so members can buy various preparations prepacked, without having to source the elusive cow horns. A good idea really, as it allows you to try their products without the angst. A smaller range of products is also available to non-members.

Check out the preparations and products on the website at www.biodynamics.net.au by selecting Products, Active Members. You'll find liquid manures, prepacked compost preparations and garden kits, as well as Horn Clay Preparation and Horn Basalt Preparation, for example. In New Zealand, go to www.biodynamic.org.nz and click on Biodynamic Orders.

If you want to make your own preparations, however, you really need to become a member of the relevant organisation in Australia or New

Zealand to obtain a manual, and you'll probably want to attend a workshop or two.

Here are the most common preparations and what they do for your garden:

- **Horn Manure Preparation 500:** This potion involves packing cow manure into a cow horn, which is buried in the soil of your garden over the winter months. At winter's end, when the horn is dug up, the manure will have transformed into a beautiful dark crumbly matter with a low pH and plenty of nitrogen for your plants. The preparation is mixed vigorously with water for an hour to increase oxygen levels, and used in minute amounts as a fine spray over the entire garden. This stuff is as precious as gold and will transform your soil, increasing earthworm activity and improving moisture retention and soil structure.

The spraying must be done late in the afternoon in a descending, or waning, moon phase. Want to know when that is? Check the antipodean calendar, which is available on the Biodynamic Agriculture Australia website (www.biodynamics.net.au).

- **Horn Clay Preparation:** This one is made from clay, mixed with enough water to form a slurry and placed into a cow horn, which is then buried in the garden over winter (Winter Horn Clay) or summer (Summer Horn Clay). It's then dug up and mixed with water, the same as for Horn Manure Preparation, and often the two preparations are mixed together.

The Winter Clay Horn solution, used as a soil spray, acts as a mediator between the atmosphere and the soil, and immensely increases the friendly fungi in your sustainable garden. Summer Horn Clay is used as an atmospheric spray in the early morning to improve the sap flow between the roots and the fruit of your plants, and greatly increase vegetative activity.

- **Horn Silica Preparation 501:** For this you need ground quartz crystal, which you place into a cow horn and bury over summer. When you dig up the horn and extract the preparation, you mix a small amount with water, stirred in the same manner and for the same amount of time as the Horn Manure Preparation.

Applied as an atmospheric spray, in a light mist, Horn Silica Preparation 501 assists photosynthesis and protects against insect attack and fungal disease in your sustainable garden.

Other Fertilisers, Tonics and Compost, the Biodynamic Way

Biodynamic farmers and gardeners also have recipes for liquid manure preparations, seaweed fertilisers and fish concentrates, and tonics for your plants. One tonic made from stinging nettle is reputed to deter the larvae of various critters, as well as caterpillars, aphids and fungal attacks.

Brews with peculiar names do marvellous things for your sustainable garden, such as Roadside Kill Brew, which has a similar effect to blood and bone, except that you must first scrape the animal off the road! Fuzzy Brew, a mixture of cow dung, molasses, cow urine, yoghurt and manure concentrate, is a magic potion that aids soil fertility in tropical regions.

Trying out tonics

Sprays made from *Equisetum* species (horsetails, which are one of the world's worst weeds and are a potential environmental threat in both Australia and New Zealand) or casuarina needles are also beneficial to plants in your sustainable garden, fighting off fungal diseases.

Making the casuarina tea yourself is pretty straightforward. Place 60 grams of dried casuarina needles per litre of water in a stainless steel saucepan and bring to the boil. Simmer for 20 minutes. Dilute the tea in the proportion of 1 part finished tea to every 40 parts water. For the average backyard you need about 100 millilitres of tea to 4 litres of water. Use as a fine atmospheric spray around your plants early in the morning.

Building biodynamic compost

Biodynamic compost preparations can be purchased from the Biodynamic Agriculture Association in Australia, or the Bio Dynamic Farming and Gardening Association in New Zealand, which is fortunate, because finding some of the ingredients for these preparations could be just a little bit tricky for the average home gardener. For example, the yarrow preparation requires you to place yarrow flowers into a stag's bladder. Sustainable as you may be, you probably don't have ready access to that sort of thing! Likewise, the

chamomile preparation requires you to place chamomile flowers into the intestines of a cow, and the oak bark preparation, to place oak bark into the skull of a cow. I think I'll opt for the ready-made.

Healthy soil — that is, soil with an abundance of humus, microorganisms and earthworm activity — rewards you time and again with healthy plants and prolific cropping and fruit supply, achieved with the assistance of your biodynamic compost, which is prepared a little differently to your everyday compost (refer to Chapter 9).

If you're serious about building a biodynamic compost heap, read the 'recipe' before gathering the ingredients. No point embarking on this project only to find that halfway through you've run out of manure to make the slurry, or straw to make another layer. The 'regular' home-garden compost heap is a work in progress, because every day something else gets added, the spud peelings or the grass clippings (whoops, I'd better chuck on some straw today because it's looking a bit wet). The biodynamic compost heap is built to completion in a day.

First you need to purchase a set of the compost preparations from your local biodynamic association (most are really quite impossible for the home gardener to make because of the nature of the ingredients). The compost preparations do a number of things. They:

- Stimulate bacterial activity in the soil.
- Stimulate major nutrients in the soil so they're readily available.
- Strengthen plants against insect and fungal attacks.

So, on with the heap. Here's the recipe for a heap that will end up as a kind of compost cube about 1.5 cubic metres, which should give you a heaped garden wheelbarrow of humus, roughly 160 litres dry weight:

1. Start the bottom of the heap on bare earth with a straw or hay layer (or other carbon material) of about 15 centimetres deep and about 1 to 1.5 metres square.

This provides adequate air circulation and allows your friendly little earthworms to find a way in to do their miraculous work. Lack of air produces a smelly, stinky sludge, certainly of no value in your sustainable garden!

2. Prepare a slurry of cow manure mixed with water (you'll need about 15 litres of the stuff all up), and pour half a bucket over the straw or hay.

The manure slurry adds moisture to the pile and provides microorganisms to assist with decomposition.

3. Now add a 30-centimetre layer of fresh greens and sprinkle the green materials with a handful of lime.

You can use chopped up fresh prunings or vegies that have gone to seed here. You can use grass clippings, but sparingly — no more than an average grass catcher can hold.

4. Next add another 15-centimetre layer of straw or hay and then pour over another half a bucket of manure slurry.

5. Now add a thin layer of the dry minerals and additives.

These will have been provided with your set of preparations, and will likely be basalt dust, seaweed powder or rock phosphate.

6. Add more straw or hay and another layer of manure slurry in the same proportions as at Step 4.

7. Add another layer of green material and sprinkle with a handful of lime, following with a layer of straw, and more minerals and additives.

Continue this process until the heap is about 1.5 metres high, finishing with a layer of straw.

8. Now insert the biodynamic preparations into the heap.

Use a long wooden rake handle to poke five holes into the heap, one in the top and four around the sides, and insert the preparations into each hole.

9. Complete the project by spraying with Valerian 507, which should also come with your pack.

The heap can be turned, a very physical and difficult process using a garden fork, after six weeks. This assists with aeration and speedier breakdown of the materials in the heap.

After about 10 to 12 weeks, you should end up with a beautiful dark crumbly substance — humus — with a rich earthy smell. It shouldn't resemble any of the ingredients that went into it. You can spread a spadeful of the humus over a new vegie patch and dig it into the soil, spread it to a depth of 3 or 4 centimetres around the dripline of vegie or garden plants or even add it to coarse sand to use as a seed-raising or potting mix (refer to Chapter 14 for recipes to make your own

potting mixes).

Humus is a soil conditioner rather than a fertiliser, so it shouldn't overwhelm your plants with nutrients, but frugal use often produces the best results.

To find out more about biodynamics, go to www.biodynamics.net.au in Australia or check out all the Australian biodynamic organisations at www.demeter.org.au (click on About Us). In New Zealand, check out www.biodynamic.org.nz/demeter.html. From these websites, you can become a member and obtain manuals or even sign up for workshops. It's a whole new way of managing your soils, for both gardens and farms, in a sustainable manner.

Part VI

The Part of Tens

Glenn Lumsden

‘You want some weeds whacked?’

In this part . . .

I love writing lists; in fact, if I go shopping without a list, I can get quite confused and come home with all sorts of things I probably don’t need. To avoid that sort of disaster in my garden, I make lists all the time. I list the type and number of seeds I sow, the number of pumpkins I harvest each year, when I last gave each plant a dose of fertiliser, what has gone onto the compost and how long it’s taking to break down, when the roses were pruned — all sorts of things.

In this part of the book, I get to indulge in my passion. I give you a list of ten ways your sustainable garden rewards you, ten weed facts to help you identify and destroy the little nasties, and a list of ten tips to help you maintain your sustainable garden.

I hope this part inspires you to make up your own lists of ways to garden sustainably and help save the planet.

Chapter 18

Ten Ways Your Sustainable Garden Rewards You

In This Chapter

- Keeping you and your family active, healthy, and informed
- Using less water, and no chemical fertilisers or pesticides
- Creating habitats, biodiversity and carbon traps, and saving the planet

The most obvious way that your sustainable garden rewards you is by making you feel good about yourself because you're doing something tangible, getting your hands dirty to help save the planet.

A Sustainable Garden Keeps You Healthy

What better way to keep healthy than by growing your own food. Your sustainable garden can produce delicious organic food, and that has to be good for both your physical and mental health. Refer to Chapter 12 for more on growing edible gardens, and Chapter 15 for information on organic gardening.

You learn to love your sustainable garden so much that you spend more time outdoors tending your garden. You're more active, spend more time in the fresh air and get plenty of exercise, and you save money on gym memberships!

You Use Less Water

A sustainable garden uses less water because, by its very nature and design, it retains moisture and, for the most part, can live off the sky. Sustainable gardens use organic mulches that nurture the soil. You group plants according to their water needs and you use recycled or greywater as much as possible.

These practices mean that a sustainable garden is also a water-efficient garden. Good for the environment, particularly in areas where the water supply is dwindling, and, if you have to pay for water, good for your bank balance. Chapter 3 gives you the lowdown on water and Chapter 11 tells you all about climate-friendly gardening.

You Don't Rely on Fertilisers

Sustainable organic gardens rely on soil conditioners such as compost, teas, various manures and worm castings. These natural soil conditioners help build organic matter in your soil and encourage healthy microorganisms and worms, which then do the work for you, helping to hold on to moisture and keep your soil rich, healthy and fertile. Your plants love you for it. Refer to Chapter 2 for more on soil conditioning.

You Make Free Compost

You really don't want to spend your hard-earned cash on compost if you don't need to. Even if you have a tiny sustainable garden, you can make your own compost (refer to Chapter 9). What a sense of satisfaction it gives you to turn your kitchen and garden scraps into delicious, healthy, sweet-smelling, life-giving compost. Yum!

You Help to Store Carbon

By planting a diverse range of plants in your sustainable garden you help to store carbon in your soil. Planting long-lived perennial plants such as shrubs and trees, and even lawn grasses, is a great way of putting carbon back into the soil and keeping it there. Another way

you can help to reduce your carbon footprint.

Your Kids Learn Where Their Food Comes From

Unfortunately, some kids think that food comes from the supermarket; that, if it's not in a packet, you can't eat it. Kids who won't eat vegies often change their tune if they do the growing and picking themselves. By raising kids in the environment of a sustainable garden they may reward you in the future by continuing to garden sustainably as adults. Gardening and producing food sustainably helps the whole family to appreciate the joy of eating seasonally. They hang out for the first summer strawberries, though maybe they won't be so excited about the winter broccoli.

Growing and eating seasonal fruit, vegies and herbs also teaches your kids that these things don't just come out of tins or the freezer section of the supermarket. You can even revive the art of bottling, drying and preserving your excess. Check out Chapter 12 for information about growing edible plants.

You Help to Increase Biodiversity and Create Habitat

Imagine your delight, and the delight of any children in your life, when you discover a lizard family that has taken up residence among the leaf litter and rocks in a quiet corner of the garden.

Creating habitat for native plants and critters helps to extend or even save threatened habitats in the wild. With urban development encroaching on native habitat almost by the day, and with native plants and animals having to compete for space, food and shelter with feral plants and animals, they need all the help you can give them. Refer to Chapter 7 for more on biodiversity.

I'm constantly distracted from whatever job I'm supposed to be doing by the New Holland honeyeaters that live in my yard. I can watch them for hours.

Gardening Is Easier: Less Work Means More Play

A well-designed sustainable garden creates a balanced ecosystem. When you have balance, the garden is able to survive and thrive with little intervention. Pests and diseases become much less troublesome because the good guys of the insect world take care of them for you.

Your well-mulched sustainable garden needs less water and the mulch smothers the weeds for you, so no need to spend your weekends weeding.

If your sustainable garden has food plants, you happily harvest your own tasty fruit, vegies and herbs, which means less time shopping for food, and more time shopping for shoes!

Sustainable Gardening Weans You Off Chemicals

A balanced biodiverse garden attracts a healthy mix of good and bad bugs and other predators to help to ensure you don't have an explosion of pests and diseases. Sustainable gardening practices are designed to be in harmony with nature and require little intervention from you. Chapter 8 gives you loads of tips for keeping your garden healthy without chemicals.

Food grown without synthetic fertilisers and chemicals tastes so good you soon take all your chemicals away to be responsibly disposed of, never to see your garden again.

You Become a Leader, Not a Follower

Don't wait for someone else to save the planet! Governments and others in power can argue until the cows come home about the best sustainable measures to put in place, and the timelines to introduce

them. We'll all grow old and the Earth will continue to decline while we wait for someone else to do something.

You can make a difference — the revolution starts now, in your yard.

Chapter 19

Ten Facts about Weeds

In This Chapter

- Knowing when a plant becomes a weed
- Understanding how weeds compete with native plants
- Looking at the damage weeds cause, and how they can be useful
- Examining how weeds are spread
- Doing your bit to limit weeds

So what's all the fuss about weeds? Sure, they're annoying in the garden, but you just pull them out or hit 'em with some weed spray and it'll be all right. Well, not quite. To start with, weed sprays, even on a small scale, generally contain chemicals that can also be a serious threat to the natural environment. Looking at the bigger picture, weeds cost government and industry millions of dollars each year; they are a serious threat to the natural environment and agricultural industries.

Weeds wreak havoc on not just your garden; they muck up natural landscapes, waterways, coastlines and farmlands as well. When weeds spread across the country, they threaten and then change the natural balance of the land, which then threatens the survival of native plants and animals.

Pretty serious stuff. To help in the fight against these nasty plants, in this chapter I give you ten facts about weeds that you always need to bear in mind so you don't inadvertently help to spread them. In the Appendix, I list some of these bad guys from areas around Australia and New Zealand for you to get to know. These plants started out as garden plants and have managed to jump the fence and wreak havoc.

Good Plants Can Go Feral

Sometimes it's hard to work out when a plant is a weed. Some people who love their native plants tell you any plant that is introduced into the country from somewhere else is a weed. Even plants that come from other parts of the country may be called weeds.

Both the Australian and New Zealand governments say weeds are any plants that require human intervention to reduce their impact on the environment, the economy, amenity or human health. For your average gardener, a weed can be defined as a plant growing in the wrong place, or any plant that can colonise and thrive in any area where it doesn't naturally grow.

In New Zealand, after wide consultation, plants are declared pest plants or weeds under the Biosecurity Act and are then classified according to their potential harm to the environment and primary industry. The main classifications used are Economic Weeds and Environmental Weeds. Economic weeds are a problem to primary industry, and environmental weeds are a concern to the natural environment, seriously threatening natural ecosystems and biodiversity. Remember that weed species can be on both lists.

In Australia, the situation is much the same, with various government specialist bodies coming together to identify, classify, declare and prioritise plants as weeds, and devise methods to deal with them.

For more information on weed classification in New Zealand, have a look at www.biosecurity.govt.nz. Click on Pests & Diseases in the menu bar and select Plants from the dropdown menu. For more information on weed classification in Australia, check out www.weeds.gov.au.

Weeds Are Competitive

By their nature, weeds are competitive, so are often faster growing and stronger than native plants. Their ability to grow quickly, sometimes producing millions of seeds per plant, means they can easily crowd out useful plants. They pinch the food, light, water and

space from the plants you want and, if you're not careful, they crowd out the good plants until they eventually die.

Weeds are often a hiding place, a food source or home for introduced birds and animals, making their populations explode as well, so that the poor old native critters are also under serious threat. Because native critters depend on the diversity of native plants, their survival is also threatened. No plants, no critters. Weeds also choke up waterways, which wrecks the habitat of the critters that depend on these streams, rivers and lakes for their survival.

Many Identified Weeds Are Garden Escapees

You've just been down to the local nursery and brought home some beautiful new plants. The label on the plant says that it's tough, tolerant of a wide range of conditions, quick-growing and reproduces with ease. Just the thing to add to your sustainable garden. It has all the qualities you're looking for and will virtually look after itself. The perfect garden specimen! Just remember, the plants *you* love today could be the plants loathed by future generations.

Around eight to ten new weeds are identified in Australia and New Zealand each year and, of those, more than a third are garden escapees. That means they were introduced as garden plants and have jumped the garden fence and ended up in areas where they are definitely not welcome.

If in doubt, consult some of the great publications and websites with the theme 'Plant Me Instead'. They list some great native plants to use in place of some of the nasties.

Weeds Aren't Just Plants from Overseas

In Australia, native plants have become established in areas far away from their natural habitats. Some adapt so well to their new environments that they become weeds, with some plants becoming particularly problematic.

One plant to watch out for in coastal areas in the eastern states is a pretty shrub from Western Australian, the bluebell creeper *Sollya heterophylla.* This climbing, twining plant has long been planted and admired in gardens in the east of the country. Unfortunately, birds love the fruit and help to spread the seeds far and wide. When this plant gets into the bush, particularly in sandy coastal areas, it can spread quickly, forming dense thickets that smother all the other plants. This plant could potentially be more dangerous than some of the introduced climbing or twining plants because it is an Aussie native and has evolved on Aussie native soils.

The good news, if you love this plant, is that there is a cultivar called *S. heterophylla* 'Edna Walling', which has sterile seeds so it can't be spread into the bush by birds.

Weeds Damage More than the Environment

The flowers, fruit and leaves of some weeds can cause serious health problems for both humans and animals. Some plants, such as the rhus tree, can trigger severe life-threatening allergies in some people. Weeds such as lantana are poisonous if eaten by livestock.

Weeds also cost the Australian economy around $4 billion every year through damage to crops, wool and lost production. In New Zealand that figure is around $1.3 billion every year.

Not Controlling Weeds Costs More than Money

Loss of habitat from land clearing is the biggest threat to biodiversity on the planet; weeds are the second-biggest threat. In Australia, more than 2,400 different weed species are damaging the environment. Controlling these weeds costs a large amount of money, but not controlling them costs the environment even more. The area across

northern Australia infested by rubber vine (*Cryptostegia grandiflora*) is about 350,000 square kilometres — that's bigger than Victoria. This weed from Madagascar is prolific along watercourses, forming impenetrable thickets.

In New Zealand, monitoring imports to stop more weeds being brought into the country costs around $40 million each year. Controlling the 500 or so weed species already causing problems to primary industry and the environment costs around $350 million every year. The number of weed species, unfortunately, is growing. Since European settlement, an estimated 144 new plant species have arrived every year, many of them becoming, or at risk of becoming, weeds.

The cost of weeds to the unique biodiversity of both Australia and New Zealand is immeasurable.

Weeds Can Be Useful

Hard to believe but, in some situations, weeds can actually be useful. They can reduce erosion by stabilising soil, particularly along riverbanks and on slopes. Their fruit can supply good food for humans — think of blackberries, yum! — or even be used for medicine, building or craft-making.

Gorse (*Ulex europaeus*) is a great source of nectar for honey bees. Many weeds provide a habitat and steady supply of food for native animals and insects. In some cases, all they care about is food and shelter, no matter what it is. By destroying weed communities, in some instances, you could be destroying communities of native critters. Best not to take the bare-earth approach if you think your weed plot is home to native animals, but start removing the weeds in stages, replacing what you take out with desirable indigenous species if you can.

The presence of certain weed species can sometimes let you know if you have certain soil deficiencies. For example, if dock (*Rumex crispus*) pops up in the garden it could be an indicator of poor drainage, compaction of the soil, high nitrogen and acid soil. Or finding samphire (*Halosarcia* species) could mean you have high salt levels in your soil. On the other hand, fat hen (*Chenopodium album*)

usually means you have a well-balanced, ideal garden soil.

People Spread Weeds

Weeds aren't always spread by birds, animals, wind or water. People are often the worst culprits. People can spread weeds by transporting the seeds on their clothes, boots, garden tools, camping gear and vehicles. You can spread weeds by dumping garden waste on roadsides or out in the bush. Many people believe it won't matter, thinking that because garden waste is green it'll break down over time. Wrong! It does matter; in fact, many weed infestations start that way.

Although some weeds have been accidentally introduced, many of the major weed species in Australia and New Zealand were first brought in by people for use in agriculture, forestry or as garden plants.

Some nurseries still sell some weeds because they look nice. You can even buy weeds or potential weeds online, and have them delivered to your door by post. Some local aquarium suppliers also still sell some aquatic weeds because they look nice in a fish tank. Over half of New Zealand aquatic weeds have come from this source. You can even create weed problems by throwing out the left-over seed from your bird cage.

More Weeds Could Be Lurking

Some of the worst weeds in Australia and New Zealand have taken around 100 years to naturalise; that is, they've become used to the environment, adapted and started to rapidly reproduce. These plants are called *sleeper weeds*. They may be growing happily contained in gardens or on farms and then something occurs like a flood, drought, fire, land clearing or a change in climate, and they suddenly start multiplying and spreading.

The potential of these sleepers could be huge for the environment. Some current weeds have taken 100 years to get to this point — just think about what's being planted now. Could they be the weeds of the

future?

You Can Help Limit Weeds

As a sustainable gardener, you probably spend a bit more time around plants than many people. Arm yourself with knowledge and you can help in the fight against weeds. Here are a few tips:

- Get to know the weeds in your area. If you recognise them, you can help get rid of them.
- If you spot a weed, report it to the correct authorities.
- Don't chuck your green waste over the fence. Dispose of unwanted plants and their seeds wisely. You can put them in a plastic bag and leave it in the sun for a day or so — that'll fry them — or, of course, compost them.
- Find out which plants might jump your fence and don't plant them.
- Become a 'Weed Buster' or a 'Weed Warrior'. Check out the websites in the next list.

You'll find all the information you could possibly want on weeds and the programs in place to control or eradicate them on these great websites:

- For New Zealand:
  - www.biosecurity.govt.nz/pests/plants
  - www.landcareresearch.co.nz
  - http://weeds.massey.ac.nz
  - www.weedbusters.co.nz
- For Australia:
  - www.weeds.gov.au
  - www.weedwarriors.net.au

Chapter 20

Ten Tips for Maintaining Your Sustainable Garden

In This Chapter

- Rethinking the seasons
- Maintaining your garden without chemicals or waste
- Minimising water use through mulch and sustainable practices
- Choosing your plants, and your gardening friends, wisely

After all your hard work, you've finally created your sustainable garden and can sit back and enjoy it. Well, yes, but the work's not over yet. Some people confuse sustainable gardening with maintenance-free gardening. Maintenance-free gardens are those that have been concreted over and painted green! (But even then you still have to sweep.) The key to maintaining your sustainable garden is understanding it. Watching, listening and learning.

Maintaining your sustainable garden takes a bit of planning and maybe even learning to think a bit differently. When you get the hang of it, though, sustainable garden maintenance becomes less like maintenance and more a part of your lifestyle.

Sustainable garden maintenance involves knowing and understanding your garden and the environment it's in, minimising the use of chemicals, diagnosing pests and diseases, understanding how much water your garden really needs and what your natural rainfall is. You need to understand your natural environment and how your garden fits into that environment, and then garden according to your local conditions and seasons.

Sustainable garden maintenance also involves green purchasing. Choose only products for your garden that are sustainable, environmentally friendly and, if possible, recycled.

Rethink Your Thinking about Seasons

In western society, people have traditionally been influenced by four distinct seasons that begin and end on a specified date each year. When and how to maintain your garden is often still dictated by these quite specific timelines. A good example of this is in southern Victoria, where tomatoes are traditionally planted on Melbourne Cup Day, the first Tuesday of November. In the Top End of the Northern Territory and other tropical parts of Australia, tomatoes are grown in the dry season, May to October. Across the Tasman, in New Zealand, Labour Day weekend, in October, is considered the ideal tomato-planting time. But, really, the weather should be one of the things that determines your tomato planting, not the date on the calendar.

The traditional seasonal calendar for when to do jobs in the garden varies from region to region. And, with the changing climate in some areas, it has become quite different from what your old gardening books tell you. That isn't to say the method is incorrect; it may just be that the timing is a little different these days. The way to successfully maintain your sustainable garden is to understand the climate zone your garden is in.

It may all seem a bit confusing, but really it's not. Throw away the calendar and get to know the seasons in your area by looking and learning. Watch the garden and see how it changes from day to day and month to month.

Get to know the plants in your sustainable garden and what they need to thrive. Perhaps Indigenous peoples are onto something. For example, the Aboriginal people of Arnhem Land in the Northern Territory traditionally follow six seasons, which, when you think about it, probably makes a lot more sense. Get to know the seasons and cycles on your patch and plan your maintenance to fit.

If you're very new to your area, get to know the local weather patterns. In fact, get to know the locals — listen to what people have to say about when and how much it rains, for example. A number of gardening books, clubs and websites list all sorts of climate zones for Australia and New Zealand (flick back to Chapter 12 for maps).

Reuse, Recycle and Renew

The most important principle here is to make sure all organic matter stays on site. Rake up leaves to use as mulch, and add leaves, prunings, grass clippings and vegetable scraps to your compost heap to turn them into beautiful humus to use as a soil conditioner to enrich your garden. (Refer to Chapter 9 for more on compost and mulch.)

If you have a lawn, leave the clippings where you mow, because grass recycling can cut down the amount of time you spend mowing by up to 50 per cent and reduce the need to feed your lawn by up to 25 per cent.

Reuse the larger stems from your prunings as garden stakes. Make your own potting mix, or regenerate the old stuff, and reuse your old pots (check out Chapter 14 for tips on potting mix and pot maintenance). Keep your old newspapers, cardboard and carpet throw-outs to lay out under mulch to suffocate weeds or build a no-dig garden bed, very similar to sheet mulching in permaculture practice (refer to Chapters 12 and 16).

Use Green Garden Products

You'll probably need to buy something to help keep your sustainable garden well maintained. Before you buy any products, check out their green credentials. Find out how they're produced and where they come from, and ask yourself whether you really need to buy the product, or whether you can make it yourself or source it from a local renewable resource. You may have heard about limiting food miles, where people only eat food produced, in some cases, within a 100-kilometre radius of their home. How about applying the same principles to garden products? Only buy and use products that fit that category.

Don't buy products with packaging that isn't recyclable and is destined for landfill. If you have lawn and need a new mower, what about an electric or battery-powered mower rather than a petrol-driven one? Better still, buy a non-motorised push mower and

lawnmowing becomes a great healthy workout, saving you a gym membership! Chapter 13 tells you all about sustainable lawns and different lawnmowers.

Make sure any fertilisers you buy are organic, not chemical, or synthetic. Minimise or, better still, stop using chemicals (refer to Chapters 8 and 15).

Learn to Manage Pests and Diseases

Get to know the pests and diseases that are common around your place and the natural, sustainable ways you can prevent them moving in. Prevention is better than cure, as they say. Chapter 8 deals with all sorts of methods of keeping your plants healthy. If you do have an infestation of something unwanted, make sure you maintain good garden hygiene by cleaning your tools, and clearing up diseased or infested plant material.

If you have plants that are at risk of fungal or bacterial disease, make sure you water them early in the day, right at the base. Many of these problems can be spread by splashing water about the garden, with the plants not being given a chance to dry out before the weather cools at night.

If you do need to deal with a pest or disease problem, use organic, less toxic methods (refer to Chapter 15). Positively identify the problem, then investigate a sustainable solution.

Use Mulch

Mulch is such a wonderful thing, no sustainable garden should be without it. Mulch not only helps to conserve moisture, but it can also help to keep the soil temperature even, reduce erosion and stop weeds. As it breaks down, some mulch can even add nutrients to your soil and help feed your plants. The ideal mulch in your sustainable garden is organic mulch. It's even better if your garden is big enough

to generate enough organic waste such as grass clippings, fallen leaves and chipped-up prunings to make your own mulch. Chapter 9 gives you some great tips on mulch.

Be careful you don't lay your mulch out too thickly as it can have the opposite effect to what you're trying to achieve and stop any water getting through to the soil. If it's thick and pushed up against the stems or trunks of your plants, it can cause them to rot.

Think about How You Use Water

Ideally, the best sustainable garden is one that lives off whatever comes from the sky. However, if your sustainable garden includes non-native food plants such as fruit, herbs and vegetables, depending on where you live, that may not be possible. Refer to Chapter 3 for more on water use.

Here are a few tips to help reduce your water use:

- Mulch reduces water loss through evaporation and helps to conserve moisture in your soil.
- Don't use spray-type sprinklers, unless they're the type that throw out large droplets of water to replicate raindrops, such as a 'wobble head' sprinkler. With fine sprays, most of the water gets blown away and doesn't get to the plants it's intended for. Plants need water at the roots. If you can, hand water or use a dripper system.
- Let your lawn live off the sky. Sustainable gardeners understand that a brown, crispy lawn usually turns to a lush green swathe as soon as the rains come.
- If you do water, do it early in the day.
- *Hydro-zone* your garden, a technical term for grouping your plants according to how much water they need.
- Investigate ways to keep water from running off your property.

Harvest the rain as it falls or the snow as it melts. Or slow the runoff down by installing a rain garden, which directs rainwater from hard surfaces and downpipes onto the garden, or replacing your hard surfaces, where possible, with permeable surfaces. For more information on how to install a rain garden at your place, check out Chapter 5.

Choose the Right Plants

Maintaining your sustainable garden is easy if the plants you grow are the right plants for your garden. Chapter 11 tells you how to choose them. Native plants are suited to local conditions so should grow without too much fuss. Whether they're native or exotic, a wide range of plants in your garden will help to create or maintain a healthy balance so you're less likely to have a nasty infestation of pests or diseases to wreak havoc.

If your garden has a wide range of plants, beneficial bugs and birds make it their home, providing you with natural pest control. At all costs, avoid a monoculture (refer to Chapter 16); that is, a garden with only one type of plant — pests love it! There's no room for a monoculture in a sustainable garden.

Raise the Deck of Your Mower

Raising the deck of your mower by as little as 4 centimetres can go a long way to ensuring you have a healthy, lush lawn (refer to Chapter 13). Sometimes people forget that a lawn is made up of millions of little plants. By not constantly scalping those little plants, you help them develop a good strong root system; if you leave them a bit taller, they help to shade the soil surface and stop weeds germinating and taking over, and you'll have millions of strong little plants. Try not to cut the blades of grass by more than a third at a time.

If you leave the clippings where they fall, you'll be surprised at how quickly they decompose and, as they do, they add nutrients to the soil and feed the grass. It may take a bit of getting

used to. A traditional lawn demands that every last grass clipping is caught or raked up, but leaving the clippings on the lawn adds nitrogen to your soil and can reduce your fertiliser use.

Fertilise Only When You Need To

A common mistake many gardeners make, even sustainable gardeners, is that they overfeed the garden. By understanding your soil and the environment your garden is in, you're better able to gauge how to feed, when to feed and how much to feed your plants. Chapters 2 and 8 give you more on soil condition and feeding your plants. Some fertilisers contain high amounts of phosphates and salts that can build up in the soil and even end up in waterways, where they cause all sorts of problems.

The trick to applying fertilisers is understanding your soil and what nutrients it can supply to your plants. Fertilisers should benefit your garden, not negatively impact on the environment.

Ask for Advice

Nurseries and garden centres can provide a wealth of information, but, better still, join a group of like-minded gardeners. Check out your local community listings, ask your local council about community gardens, garden clubs or native plant societies. Some great online gardening communities are lurking in cyberspace. Refer to Chapter 14 for more on community gardens and online advice. If you can't find a local group of sustainable gardeners, start one!

Appendix

Weeds for Every Occasion — and Their Botanical Names

Weeds are a serious threat to the natural environment and the production of crops across Australia and New Zealand. They wreak havoc in gardens, waterways, natural ecosystems, agricultural areas and coastlines. In fact, many major weeds are garden escapees; that means they started out as desirable garden plants and adapted so well to their environment they jumped the fence and spread across the countryside.

You might well be wondering what a weed actually is. Well, a weed is defined as a plant growing where it's not wanted. It's a plant that needs intervention to stop it damaging the environment, the economy or even the health of humans and animals.

A weed is a plant that is usually able to reproduce rapidly and easily in a wide range of environmental conditions.

Australia

Throughout Australia, weeds are spreading faster than they can be controlled, and their management is consuming an enormous amount of resources. Climate change poses an additional challenge to our ability to manage weeds. Following is a list, by state (or territory), of just a few of the weeds that have been identified as environmental weeds or in danger of becoming so. Check out the website, www.weeds.org.au, for many, many more.

Australian Capital Territory

Black locust *Robinia pseudoacacia*
Broom *Cytisus* spp.
Cotoneaster *Cotoneaster* spp.
Firethorn *Pyracantha* spp.
Japanese honeysuckle *Lonicera japonica*
Poplar *Populus* × *canadensis* 'Italica'
Olive *Olea europaea*
Radiata pine *Pinus radiata*
White poplar *Populus alba*

New South Wales

Banana passionfruit *Passiflora tarminiana, P. mollissima*
Broom *Cytisus* and *Genista* spp.
Cat's claw creeper *Macfadyena unguis-cati*
Glory lily *Gloriosa superba*
Honeysuckle *Lonicera japonica*
Hymenachne *Hymenachne amplexicaulis*
Lantana *Lantana camara* and *L. delagoense* 'Houghtonii'
Pittosporum *Pittosporum undulatum*
Privet *Ligustrum lucidum*
Tradescantia *Tradescantia fluminensis*
Wandering trad *Tradescantia albiflora*
Water hyacinth *Eichhornia crassipes*
Water lettuce *Pistia stratiotes*
Water primrose *Ludwigia peruviana*
Willow *Salix* spp.

Northern Territory

The Territory has two distinct regions — the Top End and the Arid Zone — and the conditions favouring particular weed species is quite different in each region.

Top End

Bellyache bush *Jatropha gossypiifolia*
Bridal creeper *Asparagus asparagoides*
Calotrope *Calotropis procera*
Gamba grass *Andropogon gayanus*
Hymenachne *Hymenachne amplexicaulis*
Mimosa *Mimosa pigra*
Para grass *Urochloa mutica*
Rubber vine *Cryptostegia grandiflora*
Salvinia *Salvinia molesta*
Singapore daisy *Sphagneticola trilobata*
Water hyacinth *Eichhornia crassipes*
Water lettuce *Pistia stratiotes*
Water mimosa *Neptunia oleracea*
Water primrose *Ludwigia peruviana*
Willow *Salix* spp.

Arid Zone

Athel pine *Tamarix aphylla*
Bathurst burr *Xanthium spinosum*
Boxthorn *Lycium ferocissimum*
Buffel grass *Cenchrus ciliaris*
Bulbil watsonia *Watsonia meriana* var. *bulbillifera*
Cabomba *Cabomba caroliniana*
Calotrope *Calotropis procera*
Camel thistle *Silybum marianum*
Cane cactus *Eriocereus jusbertii*
Castor oil plant *Ricinus communis*
Cat's claw creeper *Macfadyena unguis-cati*
Chinee apple *Ziziphus mauritiana*
Coolatai grass *Hyparrhenia hirta*
Cotton bush *Maireana georgei*
Crofton weed *Ageratina adenophora*
Date palm *Phoenix dactylifera*
Devil's claw *Ibicella lutea*
Dodder *Cuscuta* spp.
Fountain grass *Cenchrus setaceum*
Gamba grass *Andropogon gayanus*
Giant rat's tail grass *Sporobolus pyramidalis*
Harrisia cactus *Harrisia martinii*
Hudson pear *Cereus uruguayanus*
Hymenachne *Hymenachne amplexicaulis*
Khaki weed *Alternanthera pungens*
Lantana *Lantana camara*
Mesquite *Prosopis* spp.
Mimosa *Mimosa pigra*
Mother of millions *Bryophyllum delagoense*
Noogoora burr *Xanthium occidentale*
Parkinsonia *Parkinsonia aculeata*
Parthenium *Parthenium hysterophorus*
Pond apple *Annona glabra*
Prickly acacia *Vachellia nilotica*
Prickly pear *Opuntia* spp.
Rubber vine *Cryptostegia grandiflora*
Rubber bush *Calotropis procera*
Salvinia *Salvinia molesta*
Sandpaper fig *Ficus coronata*
Singapore daisy *Sphagneticola trilobata*
Snakeweed *Stachytarpheta* spp.
Sowthistle *Sonchus* spp.
Spiny burr grass *Cenchrus longisetus*
Thistle *Carduus* spp.
Water hyacinth *Eichhornia crassipes*
Water lettuce *Pistia stratiotes*
Water mimosa *Neptunia oleracea*
Water primrose *Ludwigia peruviana*
Willow *Salix* spp.
Wireweed *Sida acuta*

Hybanthus enneaspermus (was *Viola*)
Leucaena leucocephala (was *L. glauca*)
Melaleuca quinquenervia

Hybrid hibiscus
Leucaena (coffee bush)
Wild cedar

Queensland

Coreopsis lanceolata
Gloriosa superba
Psidium guajava, P. guineense
Lonicera japonica cultivars
Mimosa pudica
Murraya paniculata ‘Exotica’
Myriophyllum aquaticum
Pinus pinaster
Taro
Xanthosoma sagittifolium

Coreopsis
Gloriosa
Guava
Japanese honeysuckle
Mickey Mouse plant
Murraya
Parrot’s feather
Pink pine
Taro
Yellow arum lily

South Australia

Acacia baileyana
Acacia longifolia
Cortaderia selloana
Gazania linearis cultivars
Golden wattle
Kikuyu grass
Olea europaea
Periwinkle
Toxicodendron succedaneum
Wild cotton

Cootamundra wattle
Fountain grass
Golden wattle
Kikuyu grass
Olive
Periwinkle
Rhus tree
Wild cotton

Tasmania

Asparagus scandens
Broussonetia papyrifera
Cytisus scoparius
Lupinus arboreus
Lycaste aromatica
Ilex aquifolium
Lonicera periclymenum
Pinus radiata
Solanum mauritianum
Ulex europaeus

Asparagus fern
Paper mulberry
Broom
Tree lupin
Honeysuckle
Holly
Honeysuckle
Radiata pine
Wild tobacco tree
Gorse

Victoria

African lovegrass
Common horsetail
Gazania spp.
Horsetail
Oxalis spp.
Pepper tree
Periwinkle
Prickly pear
Spanish heath
Watsonia

Western Australia

Arum lily
Bridal creeper
Cape tulip
Freesia
Spotted gum
Sweet pittosporum
Sydney golden wattle
Watsonia spp.
Weeping willow

Across the Tasman: New Zealand

In New Zealand, weeds are divided into two main categories; economic weeds and environmental weeds. Many of the weed species are common to both the North and South Islands, whereas some only occur in one or the other, so far. Be aware that some weeds may pose a danger in other areas as they adapt and spread.

Weeds of New Zealand are listed on the National Pest Plant Accord. You can find out about these weeds by going to the Biosecurity New Zealand website, www.biosecurity.govt.nz. Click on Pests & Diseases in the menu bar and select Plants from the dropdown menu.

Alligator weed

Apple of Sodom *Solanum linnaeanum*
Asparagus *Asparagus asparagus*
Gorse *Ulex europaeus*
Heather *Calluna vulgaris*
Hornwort *Ceratophyllum demersum*
Lantana *Lantana camara*
Pampas grass *Cortaderia selloana*
Radiata pine *Pinus radiata*
Tiger primel *Mimulus luteus*

Causing a major weed problem in New Zealand, particularly in the South Island, are naturalised conifers commonly referred to as *wilding pines*, with 18 conifers identified as such. They reproduce rapidly, causing dense stands to develop, which crowd out native vegetation and important habitat for native critters. Some of the worst offenders so far are contorta pine, Corsican pine, Douglas fir and larch.

Glossary

annual: A plant that completes its life cycle in one year. See also *perennial*.

bare-rooted stock: Small trees supplied by nurseries, with root systems cushioned in sawdust or a similar moist medium and often wrapped in plastic.

basalt dust: An all-purpose mineral fertiliser. See also *granite dust*.

biodiversity: The number and variety of plant and animal species, as well as ecosystems themselves, in a given area.

biodynamics: A system of farming or gardening that uses organic methods and specially devised preparations to enhance soils, produce and animals.

biological pest control: The use of other living organisms to control pests or diseases. See also *cultural pest control* and *integrated pest management*.

bioregion: A geographical area that is home to particular species of plants and animals.

blackwater: The untreated waste from kitchen sinks and toilets. Also known as sewage or wastewater. See also *greywater*.

blood and bone: An organic fertiliser and *soil conditioner* best used in compost; use sparingly straight on the garden.

bokashi: A type of *compost* system that can be set up in the kitchen; fermented organic matter in Japanese.

capillary action: A phenomenon in which water is pulled against the pull of gravity because of molecular attraction.

carbon material: Long-dead material, such as newspaper, cardboard and straw, used in *compost* in roughly equal proportion with *nitrogen material*.

castings: See *vermicasts*.

cation exchange capacity (CEC): The capacity of soil to allow the

exchange of positive hydrogen ions, generated when a plant breathes out through its root cells, with positively charged ions associated with negatively charged surfaces of soil solutions. Soil with a high CEC means plants are better able to absorb the nutrients they need.

climate-friendly plant: A plant that suits the particular regional environment and climate it's planted in, including soil type and water availability in different seasons. See also *drought-tolerant plant*, *water-wise plant* and *xerophyte*.

coir fibre: A fibre made from the outer husk of a coconut, often purchased in compressed blocks and used in homemade potting mixes and worm farms as a sustainable substitute for *peatmoss*, or bogpeat, and as a mulch; also called coco peat or coir peat.

companion planting: The practice of locating certain plants together to deter pests or improve the flavour of particular fruits or vegetables. See also *guild planting*.

compost: A mixture of decaying plant matter, manure and other organic waste, with the end product, *humus*, being used to fertilise and condition soil.

controlled-release fertiliser: A fertiliser, usually in pellet form, called a *prill*, with a protective coating that opens up when soil temperature increases during the growing season and shuts down when it's too cold. See also *slow-release fertiliser*.

cultivar: A variety of plant produced only under cultivation.

cultural pest control: The use of physical methods, such as pruning, installing barriers or improving air movement or soil quality, to control pests or diseases. See also *biological pest control* and *integrated pest management*.

deadheading: Removing dead flowers from a plant before they go to seed.

deciduous: A plant that sheds its foliage at the end of the growing season.

dilute soil solution: A thin film of water that covers the roots of plants growing in soil.

dolamite: A product comprised of limestone that raises soil *pH*, provides plants with nutrients, improves acid soil structure and assists the decomposition of organic matter.

drainage: The removal of surface and subsurface water from an area.

dripline: The outer edge of the ground beneath a tree or shrub.

dripper: An irrigation device attached to poly pipe run around the garden; the drippers sit under the *mulch* on the garden bed to slowly release water.

drought-tolerant plant: A plant with low or very low water needs, after it's established. Also called dry-tolerant. See also *climate-friendly plant*, *water-wise plant* and *xerophyte*.

eco-sourcing: The practice of sourcing plants from the place of origin of a species. Also called *local provenance*.

effluent: Treated sewage. See also *blackwater*.

espaliered plant: A tree, shrub or climbing plant that is trained to grow along horizontal and vertical wires on a wall or fence.

evergreen: A plant that has persistently green foliage throughout the year.

exotic plant: An introduced plant, not native to a country or area.

extinct: When a species no longer has any living members, therefore no longer exists as an animal or plant.

first-flush diversion: A system on a water tank to divert the first rush of dirty water from the roof to a separate pipe and not into the tank.

fish emulsion: An organic fertiliser made mainly from introduced fish species.

foliar spray: A solution applied to plant foliage.

friable: A characteristic of soil that makes it easily crumbled.

garden lime: A mineral fertiliser and soil conditioner that raises *pH*.

germinate: The action of initial growth in a plant or seed.

grafting: A method of plant *propagation* where tissue from one plant is fused with the tissue of another plant of the same species.

granite dust: An all-purpose mineral fertiliser. See also *basalt dust*.

greywacke: A type of sedimentary rock common in New Zealand.

greywater: The wastewater from bathrooms, laundries and dishwashers (anywhere except kitchen sinks and toilets). See also *blackwater*.

growing media: The substance that a plant is rooted in, such as potting mix, hydroponic solution or soil.

guild planting: The *permaculture* practice of planting a variety of plants together to deter pests or improve the flavour of certain fruits or vegetables. See also *companion planting*.

gypsum: A mineral *soil conditioner* that adds calcium to soil but doesn't change its *pH*.

heritage variety: A type of edible or flowering plant that has been passed down through generations, rather than being bred or hybridised.

humus: The organic component of soil, made from partially decomposed organic matter, or *compost*.

hydro-mulch: A preparation of *mulch* and fertiliser mixed to a slurry and pumped through a hose onto a large area, to stabilise banks along freeways, for example; mixed with grass seed, a method of establishing a lawn in tricky or large areas.

hydro-zoning: A landscaping practice in which plants of similar water needs are grouped together.

hydrophobic soil: Soil that is so dry it becomes water-repellent.

indigenous plant: A plant that originates in a particular area. See also *native plant*.

inorganic: State of a substance that does not contain carbon, being neither plant nor animal.

insectary: A garden plot planted with a variety of plants that attract beneficial insects.

integrated pest management (IPM): A system of pest and disease control using a combination of *cultural* and *biological* methods, along with limited chemicals.

lime: See *garden lime*.

loam: A relatively equal mix of sand and *silt*, combined with a smaller proportion of clay.

local provenance: The practice of sourcing plants from the place of origin of a species. Also called *eco-sourcing*.

microorganism: An organism of microscopic size.

monoculture: Large areas planted with a single species.

mudmap: A rough aerial sketch of a site, not to scale.

mulch: A layer of *organic* material (straw or bark, for example) or *inorganic* material (such as pebbles) covering the soil around plants.

multigraft: A single tree with two or three different varieties of the same species *grafted* onto a shared trunk.

native plant: A plant that originates in a particular country and is said to be native to perhaps the whole country. See also *indigenous plant*.

nematode: A type of worm that can attack plant roots; some types are parasitic, some beneficial.

nitrogen-fixing plants: Plants, such as legumes, that put nitrogen back into the soil.

nitrogen material: Recently growing material, such as kitchen scraps, grass clippings, leaves and prunings, used in *compost* in roughly equal proportion with *carbon material*.

NPK ratio: A measure of the percentages of the plant *nutrients* nitrogen (N), phosphorus (P) and potassium (K) found in soil and used in fertilisers.

nutrient: A chemical that an organism needs to live and grow or a substance that is used in an organism's metabolism.

organic: State of a substance derived from plant and animal matter, things that once were living.

particle size analysis: A method of testing soil to see its proportions of sand, *silt* and clay.

pathogen: A disease-causing element.

peatmoss: A non-sustainable resource extracted from marshlands and used in *potting mixes* and as a *mulch*; also called bogpeat. See *coir fibre* for its sustainable substitute.

perennial: A plant that lives for more than two years. See also *annual*.

perlite: A volcanic mineral used in many *potting mixes* due to its *drainage* attributes.

permaculture: A gardening design system that seeks to integrate all aspects of a garden in order to achieve sustainable use of resources.

permeable: A surface that allows water to penetrate.

pH: The measurement of acidity or alkalinity of a solution or soil.

pollinator: Something (an insect, for example) that fertilises plants by carrying pollen from the male to the female parts of a plant.

potbound: See *rootbound*.

pottager garden: A mixed garden of herbs, vegetables, and fruiting, flowering and ornamental plants.

potting mix: A mixture used to grow plants in a contained garden environment, usually made from composted *organic* material such as pine bark, *coir fibre* and leaves.

preparations: *Humus*-like substances produced in *biodynamic* farming or gardening to enhance soil and plants.

prill: A *controlled-release fertiliser* pellet with a protective coating.

propagate: To grow a plant from seeds or cuttings.

provenance: See *local provenance*.

rain garden: A purpose-built garden that redirects stormwater and runoff from the roof and hard surfaces, through a filtering system, to the garden.

rainwater harvesting system: A rainwater tank.

rhizome: A thickened stem, particularly on some grass species, that spreads under the ground parallel to the soil surface, sending up aerial shoots at intervals. See also *stolon*.

roguing: A *cultural pest control* method of removing diseased or bug-infected plants.

rootbound: A condition where a potted plant has outgrown its pot so that the roots have become thickly matted and have grown around

the pot rather than straight down; also called potbound.

rootstock: The bottom half of a *grafted* plant. See also *scion*.

salinity: Salt content, especially of soil or water.

scion: The top half of a *grafted* plant. See also *rootstock*.

seaweed extract: An organic fertiliser made from seaweed and kelp.

sewage: See *blackwater*.

sheet mulching: A technique in *permaculture* for preparing an area for a garden bed that requires no digging.

silt: Very fine sand or earthy matter that has at some time been moved by running water and deposited as sediment.

site analysis: The practice of critically analysing all aspects of a garden in order to redesign it or of a new site in order to plan a garden.

sleeper weed: An introduced plant that has escaped a contained planting in a garden or farm and adapted to the environment, with the potential to reproduce rapidly.

slow-release fertiliser: A fertiliser, usually in granule form, with a protective coating of *sulfur* or a polymer that gradually breaks down to release nutrients. See also *controlled-release fertiliser*.

soil conditioner: An additive that improves soil structure and fertility, such as worm castings (*vermicasts*), horse manure, *garden lime*, *sulfur* or *gypsum*.

soil food web: The interrelationship of different microorganisms, worms and insects in the soil.

soil profile: The different bands of a particular soil, typically topsoil, subsoil, parent material and bedrock.

solarisation: A method of killing *weeds* using heat generated by laying down plastic over an affected area.

sooty mould: A fungal disease caused by scale, a sap-sucking insect.

stolon: A stem, particularly on some grass species, that spreads along the soil surface. See also *rhizome*.

succulent: A type of plant that retains water in fleshy tissues in its leaves, stems and roots.

sulfur: In powder form, a mineral fertiliser that lowers *pH*; in dust form, used to control a number of plant diseases.

swale: A series of parallel ditches dug across a slope to slow down water runoff, advocated in *permaculture*.

trenching: A method of keeping or attracting earthworms to nourish soil by depositing food scraps and manures into a shallow trench in the garden.

upright micro-spray: An irrigation device attached to poly pipe running around the garden; the sprays stand about 10 to 30 centimetres above the garden bed.

vermicast tea: The liquid that accumulates at the bottom of worm farms, used as a fertiliser when diluted to look like weak black tea; also called worm wee.

vermicasts: Also called worm castings or vermicompost, the waste and broken down organic matter from worm farms, used as a *soil conditioner* and *organic* fertiliser.

vertical garden: Any garden or garden feature that requires a plant to grow vertically on a frame.

vulnerable: State of a plant species when its population is decreasing because of threatening processes or when the population has been seriously depleted and its protection is not secured or it's at risk.

wall garden: A *vertical garden* that specifically uses a wall as the frame.

wastewater: See *blackwater*.

water-wise plant: A plant that can survive off the natural rainfall of a particular region, at whatever level, without supplementary watering, after it's established. See also *climate-friendly plant*, *drought-tolerant plant* and *xerophyte*.

water table: The level of the water-soaked section of earth under the ground.

water well: A feature of some plant pots that allows water to sit in a well at the base of the pot, to be drawn up into the soil by the plant's capillary action.

weed: Any plant that invades and threatens *indigenous* vegetation or primary production areas, including some *native plants* outside their place of origin. See also *sleeper weed*.

weeper hose: A device made of recycled rubber that attaches to a normal hose and sits under the *mulch* on a garden bed to slowly release water about 10 centimetres either side; also known as a leaky or porous hose.

wet feet: A condition of a plant when the soil is waterlogged from having too much water and not enough drainage, potentially causing the roots to rot.

wetting agent: A commercial product, added to soil, that reduces the surface tension of water, enabling it to penetrate the waxy surface of soil particles.

white oil: A petroleum-based product for treating *sooty mould* and other fungi.

wilding pine: Any of 18 naturalised conifers identified as *weeds* in New Zealand.

wood ash: A waste product from fireplaces used as an organic fertiliser that raises *pH*, best used in *compost*; use sparingly straight on the garden.

worm wee: See *vermicast tea*.

xerophyte: A type of plant that can survive desert conditions, such as cactus. See also *climate-friendly plant*, *drought-tolerant plant* and *water-wise plant*.